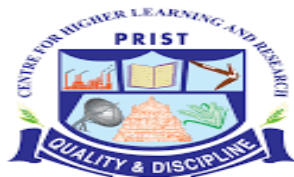


# **REGULATION**

## **R2019**



**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR- 613 403 - TAMIL NADU

## INDEX

### REGULATION-2019

S.NO	DEPARTMENTS	PAGE NO.
1	MECH	2
2	ECE	280
3	EEE	445
4	CSE	1040
5	COMMERRCE	1314
6	MANAGEMENT	1509
7	CHEMISTRY	1910
8	MICRO BIOLOGY	2051
9	ENGLISH	2199
10	MATHS	2290
11	COMPUTER SCIENCE	2447
12	PHYSICS	2699
13	BIOCHEMISTRY	2846
14	BIOTECHNOLOGY	2916
15	CIVIL	3080

## I - VIII SEMESTER CURRICULUM AND SYLLABI

**B.TECH (FT) MECHANICAL [Regulation 2019]**

### SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
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
<b>PRACTICAL</b>						
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				1
<b>TOTAL</b>			<b>19</b>	<b>2</b>	<b>12</b>	<b>25</b>

**SKILL DEVELOPMENT**

## SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19147S21	Technical English	4	0	0	4
2.	19148S22	Engineering Mathematics II	4	0	0	4
3.	19149S23C	Material Science	3	0	0	3
4.	19149S24A	Environmental Science And Engineering	3	0	0	3
5.	19153S25D	Basic Electrical, Electronics And Instrumentation Engineering	3	0	0	3
6.	19154S26D	Engineering Mechanics	3	2	0	4
<b>PRACTICAL</b>						
7.	19154L27	Engineering Practices Lab (All Branches)	0	0	3	2
8.	19153L28D	Basic Electrical, Electronics and Instrumentation Engineering Lab	0	0	3	2
9.	191ICA29	Fundamentals of Indian constitution and Economy				-
<b>TOTAL</b>			<b>20</b>	<b>2</b>	<b>6</b>	<b>25</b>

## SKILL DEVELOPMENT

**SEMESTER III**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19148S31C	Transforms and Partial Differential Equations	4	0	0	4
2.	19154C32	Engineering Thermodynamics	3	2	0	4
3.	19154C33	Fluid Mechanics and Machinery	4	0	0	4
4.	19154C34	Production Technology - I	3	0	0	3
5.	19154S35	Electrical Drives and Controls	3	0	0	3
<b>PRACTICAL</b>						
6.	19154L36	Production Technology Laboratory - I	0	0	3	2
7.	19154L37	Computer Aided Machine Drawing	0	0	3	2
8.	19154L38	Electrical Engineering Laboratory	0	0	3	2
9.	19154L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
<b>TOTAL</b>			<b>17</b>	<b>2</b>	<b>11</b>	<b>25</b>

**SKILL DEVELOPMENT**

### SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19148S41D	Statistics and Numerical Methods	4	0	0	4
2.	19154C42	Theory of Machines-I	3	0	0	3
3.	19154C43	Production Technology – II	3	0	0	3
4.	19154C44	Engineering Metallurgy	3	0	0	3
5.	19154C45	Strength of Materials for Mechanical Engineers	3	0	0	3
6.	19154C46	Thermal Engineering- I	3	0	0	3
<b>Practical</b>						
7.	19154L47	Production Technology Laboratory - II	0	0	3	2
8.	19154L48	Strength of Materials and Fluid Mechanics and Machinery Laboratory	0	0	3	2
9.	19154L49	Advanced Reading and Writing	0	0	2	1
<b>Research Skill Based (RSB) Course</b>						
10.	19154CRS	Research Led Seminar				1
<b>TOTAL</b>			<b>19</b>	<b>0</b>	<b>8</b>	<b>25</b>

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**SEMESTER V**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19154C51	Thermal Engineering- II	3	0	0	3
2.	19154C52	Design of Machine Elements	3	0	0	3
3.	19154C53	Metrology and Measurements	3	0	0	3
4.	191_ _OE54_	Open Elective I	3	0	0	3
5.	19154C55	Theory of Machines-II	3	2	0	4
<b>PRACTICAL</b>						
6.	19154L56	Theory of Machines Laboratory	0	0	3	2
7.	19154L57	Thermal Engineering Laboratory	0	0	3	2
8.	19154L58	Metrology and Measurements Laboratory	0	0	3	2
<b>Research Skill Based (RSB) Course</b>						
9.	19154CRM	Research Methodology				3
<b>TOTAL</b>			<b>16</b>	<b>6</b>	<b>9</b>	<b>25</b>

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**SEMESTER VI**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19154C61	Design of Transmission Systems	3	0	0	3
2.	19154C62	Computer Aided Design And Manufacturing	3	0	0	3
3.	19154C63	Heat and Mass Transfer	3	2	0	4
4.	19154C64	Finite Element Analysis	3	0	0	3
5.	19154C65	Hydraulics And Pneumatics	3	0	0	3
6.	19154E66_	Elective - I	3	0	0	3
<b>PRACTICAL</b>						
7.	19154L67	CAD / CAM Laboratory	0	0	3	2
8.	19154L68	Design and Fabrication Project	0	0	3	2
9.	19154L69	Professional Communication	0	0	2	1
<b>Research Skill Based (RSB) Course</b>						
10	19154CBR	Participation in Bounded Research				1
<b>TOTAL</b>			<b>18</b>	<b>2</b>	<b>8</b>	<b>25</b>

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT ENT**



## SEMESTER VII

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19154C71	Power Plant Engineering	3	0	0	3
2.	19154C72	Process Planning and Cost Estimation	3	0	0	3
3.	19154C73	Mechatronics	3	0	0	3
4.	191_ _ OE74_	Open ElectiveII	3	0	0	3
5.	19154E75_	Elective II	3	0	0	3
6.	19154E76_	Elective III	3	0	0	3
<b>PRACTICAL</b>						
7.	19154L77	Simulation and Analysis Laboratory	0	0	3	2
8.	19154L78	Mechatronics Laboratory	0	0	3	2
9.	19154L79	Technical Seminar	0	0	2	1
<b>Research Skill Based (RSB) Course</b>						
10.	19154CSR	Design /SOCIO Technical Project				3
<b>TOTAL</b>			<b>20</b>	<b>2</b>	<b>8</b>	<b>26</b>

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**SEMESTER VIII**

<b>S.No.</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>THEORY</b>						
<b>1.</b>	<b>19154S81</b>	<b>Principles of Management</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
2.	19154E82_	Elective– IV	3	0	0	3
<b>PRACTICAL</b>						
3.	19154P83	Project Work	0	0	20	10
4	19154PEE	Programme Exit Examination				2
<b>TOTAL</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>18</b>
<b>TOTAL CREDITS</b>						<b>19</b> <b>4</b>

**ENTREPRENEURSHIP**

**.ELECTIVE – I ( VI SEMESTER)**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	19154E66A	Automobile Engineering	3	0	0	3
2.	19154E66B	Safety in Engineering industries	3	0	0	3
3.	19154E66C	Gas Dynamics and Jet Propulsion	3	0	0	3
4.	19154E66D	Fundamentals of Nano Science	3	0	0	3

**EMPLOYABILITY**

**ELECTIVE – II ( VII SEMESTER)**

	COURSE CODE	COURSE TITLE	L	T	P	C
1.	19154E75A	Renewable Sources of Energy	3	0	0	3
2.	19154E75B	Nonconventional Machining Processes	3	0	0	3
3.	19154E75C	Operations Research	3	0	0	3
4.	19154E75D	Total Quality Management	3	0	0	3

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTIVE – III ( VII SEMESTER)**

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	19154E76A	Robotics	3	0	0	3
2.	19154E76B	Design of Jigs, Fixtures and Press Tools	3	0	0	3
3.	19154E76C	General Aspects of Energy Management and Energy audit	3	0	0	3
4.	19154E76D	Composite Materials	3	0	0	3

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTIVE – IV (VIII SEMESTER)**

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	19154E82A	Production Planning and Control	3	0	0	3
2.	19154E82B	Computer Integrated Manufacturing Systems	3	0	0	3
3.	19154E82C	Energy Efficiency in Thermal Utilities	3	0	0	3
4.	19154E82D	Professional Ethics in Engineering	3	0	0	3

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

### OPEN ELECTIVE– I

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	19150OE54A	Data Base management systems	3	0	0	3
2.		19150OE54B	Cloud computing	3	0	0	3
3.	ECE	19152OE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
4.		19152OE54B	Sensors And Transducers	3	0	0	3
5.	EEE	19153OE54A	Industrial Nano Technology	3	0	0	3
6.		19153OE54B	Energy Conservation and Management	3	0	0	3
7.	CIVIL	19155OE54A	Air Pollution And Control Engineering	3	0	0	3
8.		19155OE54B	Geographic Information Systems	3	0	0	3

### OPEN ELECTIVE– II

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	19150OE74A	Introduction to C programming	3	0	0	3
2.		19150OE74B	Data structures and algorithms	3	0	0	3
3.	ECE	19152OE74A	Robotics	3	0	0	3
4.		19150OE74B	Electronic devices	3	0	0	3
5.	EEE	19153OE74A	Basic circuit theory	3	0	0	3
6.		19153OE74B	Introduction to renewable energy systems	3	0	0	3
7.	CIVIL	19155OE74A	Green building design	3	0	0	3
8.		19155OE74B	Waste water treatment	3	0	0	3

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

### CGPA CREDITS

Semester	Core	Elective	Open elective	Practical	Seminar	Exit exam	Project	RSD course	Total
I	24	-	-	04	-	-	-	-	28
II	24	-	-	04	-	-	-	-	28
III	18	-	-	07	-	-	-	-	25
IV	19	-	-	05	-	-	-	01	25
V	13	-	03	06	-	-	-	03	25
VI	16	03	-	05	-	-	-	2	26
VII	09	06	03	04	01	-	-	04	27
VIII	03	03	-	-	-	02	15	-	23
<b>TOTAL</b>									<b>207</b>

### NON-CGPA CREDITS

Semester	Add on course	Total
I	01	<b>01</b>
II	01	<b>01</b>
III	-	-
IV	-	-
V	-	-
VI	-	-
VII	-	-
VIII	-	-
Co curricular Activities	In-plant Training , Industrial Visit , Seminars & Conferences	<b>03</b>
<b>TOTAL NON-CGPA CREDITS</b>		<b>05</b>

<b>TOTAL CREDITS</b>	
CGPA CREDITS	<b>207</b>
NON-CGPA CREDITS	<b>05</b>
<b>TOTAL</b>	<b>212</b>

19147S11

COMMUNICATIVE ENGLISH

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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

**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 Course book 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. CengageLearning ,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





1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> 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, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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", 12<sup>th</sup> Edition, Pearson India, 2016.

**OBJECTIVE****S:**

- 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 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

– H<sub>2</sub>-O<sub>2</sub> fuel cell.

**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)****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: 30+60 = 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.

EXT 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. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50<sup>th</sup> 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, 2<sup>nd</sup> 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.

**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'', 2<sup>nd</sup> 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.

**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 : 45 PERIODS**

19150L18

**PHYSICS AND CHEMISTRY LABORATORY**  
(Common to all branches of B.E. / B.Tech Programme)

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)**

- 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 a semiconductor
- Determination of thickness of a thin wire – Air wedge method

**TOTAL: 23 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.
- Estimation of HCl using  $\text{Na}_2\text{CO}_3$  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.<sup>32</sup>

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: 22 PERIODS**

**TEXTBOOKS:**

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

<b>191VEA19</b>	<b>VALUE EDUCATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>

**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

- a. Simplified physical exercise
- b. Meditation – Objectives, types, effect on body, mind and soul
- c. 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.

## TECHNICAL ENGLISH

### 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.

### READING AND STUDY SKILLS 12

#### UNIT II

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: 35

- 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 Black swan, 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

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

**19148S22A**

**ENGINEERING MATHEMATICS – II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### 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**

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 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 :**

After successfully completing the course, the student will have a good understanding of the following topics and their applications:

- Eigen values 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, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> 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, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3<sup>rd</sup> 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, 4<sup>th</sup> Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> Edition, New Delhi, 2012.

<b>19149S23C</b>	<b>MATERIALS SCIENCE</b> (Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering )	<b>L T P C</b> <b>3 0 0 3</b>
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**OBJECTIVES:**

- To introduce the essential principles of materials science for mechanical and related engineering applications.

**UNIT I PHASE DIAGRAMS 9**

Solid solutions - Hume Rothery's rules – the phase rule - single component system - one-component system of iron - binary phase diagrams - isomorphous systems - the tie-line rule - the lever rule - application to isomorphous system - eutectic phase diagram - peritectic phase diagram - other invariant reactions – free energy composition curves for binary systems - microstructural change during cooling.

**UNIT II FERROUS ALLOYS 9**

The iron-carbon equilibrium diagram - phases, invariant reactions - microstructure of slowly cooled steels - eutectoid steel, hypo and hypereutectoid steels - effect of alloying elements on the Fe-C system - diffusion in solids - Fick's laws - phase transformations - T-T-T-diagram for eutectoid steel – pearlitic, bainitic and martensitic transformations - tempering of martensite – steels – stainless steels – cast irons.

**UNIT III MECHANICAL PROPERTIES 9**

Tensile test - plastic deformation mechanisms - slip and twinning - role of dislocations in slip - strengthening methods - strain hardening - refinement of the grain size - solid solution strengthening - precipitation hardening - creep resistance - creep curves - mechanisms of creep - creep-resistant materials - fracture - the Griffith criterion - critical stress intensity factor and its determination - fatigue failure - fatigue tests - methods of increasing fatigue life - hardness - Rockwell and Brinell hardness - Knoop and Vickers microhardness.

**UNIT IV MAGNETIC, DIELECTRIC AND SUPERCONDUCTING MATERIALS 9**

Ferromagnetism – domain theory – types of energy – hysteresis – hard and soft magnetic materials – ferrites - dielectric materials – types of polarization – Langevin-Debye equation – frequency effects on polarization - dielectric breakdown – insulating materials – Ferroelectric materials - superconducting materials and their properties.

**UNIT V NEW MATERIALS 9**

Ceramics – types and applications – composites: classification, role of matrix and reinforcement, processing of fiber reinforced plastics – metallic glasses: types , glass forming ability of alloys, melt spinning process, applications - shape memory alloys: phases, shape memory effect, pseudoelastic effect, NiTi alloy, applications – nanomaterials: preparation (bottom up and top down approaches), properties and applications – carbon nanotubes: types.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

Upon completion of this course,

- the students will have knowledge on the various phase diagrams and their applications
- the students will acquire knowledge on Fe-Fe<sub>3</sub>C phase diagram, various microstructures and alloys
- the students will get knowledge on mechanical properties of materials and their measurement
- the students will gain knowledge on magnetic, dielectric and superconducting properties of materials
- the students will understand the basics of ceramics, composites and nanomaterials.

#### TEXT BOOKS:

1. Balasubramaniam, R. "Callister's Materials Science and Engineering". Wiley India Pvt. Ltd., 2014.
2. Raghavan, V. "Physical Metallurgy: Principles and Practice". PHI Learning, 2015.
3. Raghavan, V. "Materials Science and Engineering : A First course". PHI Learning, 2015.

#### REFERENCES

1. Askeland, D. "Materials Science and Engineering". Brooks/Cole, 2010.
2. Smith, W.F., Hashemi, J. & Prakash, R. "Materials Science and Engineering". Tata McGraw Hill Education Pvt. Ltd., 2014.
3. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials". Narosa Publishing House, 2009.

<b>19149S24A</b>	<b>ENVIRONMENTAL SCIENCE AND ENGINEERING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

#### 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. 40

- 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’, 2<sup>nd</sup> 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 Science”, Cengage Learning India PVT, LTD, Delhi, 2014.

**1915S25D BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING L T P C 3 0 0 3**

**OBJECTIVES:**

To impart knowledge on

- Electric circuit laws, single and three phase circuits and wiring
- Working principles of Electrical Machines
- Working principle of Various electronic devices and measuring instruments

**UNIT I ELECTRICAL CIRCUITS 9**

Basic circuit components -, Ohms Law - Kirchoff’s Law – Instantaneous Power – Inductors - Capacitors – Independent and Dependent Sources - steady state solution of DC circuits - Nodal analysis, Mesh analysis- Thevinin’s Theorem, Norton’s Theorem, Maximum Power transfer theorem- Linearity and Superposition Theorem.

**UNIT II AC CIRCUITS 9**

Introduction to AC circuits – waveforms and RMS value – power and power factor, single phase and three-phase balanced circuits – Three phase loads - housing wiring, industrial wiring, materials of wiring

**UNIT III ELECTRICAL MACHINES 9**

Principles of operation and characteristics of ; DC machines, Transformers (single and three phase ) ,Synchronous machines , three phase and single phase induction motors.

**UNIT IV ELECTRONIC DEVICES & CIRCUITS 9**

Types of Materials – Silicon & Germanium- N type and P type materials – PN Junction –Forward and Reverse Bias –Semiconductor Diodes –Bipolar Junction Transistor – Characteristics –Field Effect Transistors – Transistor Biasing –Introduction to operational Amplifier –Inverting Amplifier –Non Inverting Amplifier –DAC – ADC .

## UNIT V MEASUREMENTS & INSTRUMENTATION

9

Introduction to transducers - Classification of Transducers: Resistive, Inductive, Capacitive, Thermoelectric, piezoelectric, photoelectric, Hall effect and Mechanical - ,Classification of instruments

- Types of indicating Instruments - multimeters –Oscilloscopes- – three-phase power measurements
- instrument transformers (CT and PT )

**TOTAL : 45 PERIODS**

### OUTCOMES:

Ability to

- Understand electric circuits and working principles of electrical machines
- Understand the concepts of various electronic devices
- Choose appropriate instruments for electrical measurement for a specific application

### TEXT BOOKS

1. Leonard S Bobrow, “Foundations of Electrical Engineering”, Oxford University Press, 2013
2. D P Kothari and I.J Nagarath, ”Electrical Machines “Basic Electrical and Electronics Engineering”, McGraw Hill Education(India) Private Limited, Third Reprint ,2016
3. Thereja .B.L., “Fundamentals of Electrical Engineering and Electronics”, S. Chand & Co. Ltd., 2008

### REFERENCES

2. Del Toro, “Electrical Engineering Fundamentals”, Pearson Education, New Delhi, 2007
3. John Bird, “Electrical Circuit Theory and Technology”, Elsevier, First Indian Edition, 2006
4. Allan S Moris, “Measurement and Instrumentation Principles”, Elseveir, First Indian Edition, 2006
5. Rajendra Prasad, “Fundamentals of Electrical Engineering”, Prentice Hall of India, 2006
6. A.E.Fitzgerald, David E Higginbotham and Arvin Grabel, “Basic Electrical Engineering”, McGraw Hill Education(India) Private Limited, 2009
7. N K De, Dipu Sarkar, “Basic Electrical Engineering”, Universities Press (India)Private Limited 2016

**19154S26D**

**ENGINEERING MECHANICS**

**L T P C**

**3 2 0 4**

### 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”, 8<sup>th</sup> 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”, 11<sup>th</sup> Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4<sup>th</sup> 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”, 3<sup>rd</sup> 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**

**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**

**12**

**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:**

44



- (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 10**
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 10**
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: 45 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:**

**1. 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    |
| 45  |          |



- 9. Transistor based application circuits
- 10. Study of CRO and measurement of AC signals
- 11. Characteristics of LVDT
- 12. Calibration of Rotometer
- 13. RTD and Thermistor

**Minimum of 10 Experiments to be carried out :-**

**TOTAL: 45 PERIODS**

**OUTCOMES:**

- Ability to determine the speed characteristic of different electrical machines
- Ability to design simple circuits involving diodes and transistors
- Ability to use operational amplifiers

**1. LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
1	D. C. Motor Generator Set	2
2	D.C. Shunt Motor	2
3	Single Phase Transformer	2
4	Single Phase Induction Motor	2
5	Ammeter A.C and D.C	20
6	Voltmeters A.C and D.C	20
7.	Watt meters LPF and UPF	4
8.	Resistors & Breadboards	-
9.	Cathode Ray Oscilloscopes	4
10.	Dual Regulated power supplies	6
11.	A.C. Signal Generators	4
12.	Transistors (BJT, JFET)	-

**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.

**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", 43<sup>rd</sup> 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. B.V Ramana., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley, India, 2016.
3. G. James, "Advanced Modern Engineering Mathematics", 3<sup>rd</sup> Edition, Pearson Education, 2007.
4. L.C Andrews, L.C and Shivamoggi, B, "Integral Transforms for Engineers" SPIE Press, 1999.
5. N.P. Bali. and Manish Goyal, "A Textbook of Engineering Mathematics", 9<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd, 2014.
6. R.C. Wylie, and Barrett, L.C., "Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

**19154C32**

**ENGINEERING THERMODYNAMICS**

**L T P C**

**3 2 0 4**

## OBJECTIVE:

- To familiarize the students to understand the fundamentals of thermodynamics and to perform thermal analysis on their behavior and performance.

(Use of Standard and approved Steam Table, Mollier Chart, Compressibility Chart and Psychrometric Chart permitted)

## **UNIT I BASIC CONCEPTS AND FIRST LAW 9+6**

Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions. Intensive and extensive, total and specific quantities. System and their types. Thermodynamic Equilibrium State, path and process. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement work and other modes of work .P-V diagram. Zeroth law of thermodynamics – concept of temperature and thermal equilibrium– relationship between temperature scales –new temperature scales. First law of thermodynamics –application to closed and open systems – steady and unsteady flow processes.

## **UNIT II SECOND LAW AND AVAILABILITY ANALYSIS 9+6**

Heat Reservoir, source and sink. Heat Engine, Refrigerator, Heat pump. Statements of second law and its corollaries. Carnot cycle Reversed Carnot cycle, Performance. Clausius inequality. Concept of entropy, T-s diagram, Tds Equations, entropy change for - pure substance, ideal gases - different processes, principle of increase in entropy. Applications of II Law. High and low grade energy. Available and non-available energy of a source and finite body. Energy and irreversibility. Expressions for the energy of a closed system and open systems. Energy balance and entropy generation. Irreversibility. I and II law Efficiency.

## **UNIT III PROPERTIES OF PURE SUBSTANCE AND STEAM POWER CYCLE 9+6**

Formation of steam and its thermodynamic properties, p-v, p-T, T-v, T-s, h-s diagrams. p-v-T surface. Use of Steam Table and Mollier Chart. Determination of dryness fraction. Application of I and II law for pure substances. Ideal and actual Rankine cycles, Cycle Improvement Methods - Reheat and Regenerative cycles, Economiser, preheater, Binary and Combined cycles.

## **UNIT IV IDEAL AND REAL GASES, THERMODYNAMIC RELATIONS 9+6**

Properties of Ideal gas- Ideal and real gas comparison- Equations of state for ideal and real gases-

Reduced properties. Compressibility factor-Principle of Corresponding states. -Generalised Compressibility Chart and its use-. Maxwell relations, Tds Equations, Difference and ratio of heat capacities, Energy equation, Joule-Thomson Coefficient, Clausius Clapeyron equation, Phase Change Processes. Simple Calculations.

## **UNIT V GAS MIXTURES AND PSYCHROMETRY**

**9+6**

Mole and Mass fraction, Dalton's and Amagat's Law. Properties of gas mixture – Molar mass, gas constant, density, change in internal energy, enthalpy, entropy and Gibbs function. Psychrometric properties, Psychrometric charts. Property calculations of air vapour mixtures by using chart and expressions. Psychrometric process – adiabatic saturation, sensible heating and cooling, humidification, dehumidification, evaporative cooling and adiabatic mixing. Simple Applications

**TOTAL : 75 PERIODS**

### **OUTCOMES:**

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

- CO1 Apply the first law of thermodynamics for simple open and closed systems under steady and unsteady conditions.
- CO2 Apply second law of thermodynamics to open and closed systems and calculate entropy and availability.
- CO3 Apply Rankine cycle to steam power plant and compare few cycle improvement methods
- CO4 Derive simple thermodynamic relations of ideal and real gases
- CO5 Calculate the properties of gas mixtures and moist air and its use in psychometric processes

### **TEXT BOOKS :**

1. R.K.Rajput, "A Text Book Of Engineering Thermodynamics ",Fifth Edition,2017.
2. Yunus a. Cengel & michael a. Boles, "Thermodynamics", 8th edition 2015.

### **REFERENCES:**

1. Arora C.P, "Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
2. Borgnakke & Sonntag, "Fundamental of Thermodynamics", 8th Edition , 2016.
3. Chattopadhyay, P, "Engineering Thermodynamics", Oxford University Press, 2016.
4. Michael J. Moran, Howard N. Shapiro, "Fundamentals of Engineering Thermodynamics", 8th Edition.
5. Nag.P.K., "Engineering Thermodynamics", 5<sup>th</sup> Edition, Tata McGraw-Hill, New Delhi, 2013.

**19154C33**

**FLUID MECHANICS AND MACHINERY**

**L T P C  
4 0 0 4**

### **OBJECTIVES**

- The properties of fluids and concept of control volume are studied
- The applications of the conservation laws to flow through pipes are studied.
- To understand the importance of dimensional analysis
- To understand the importance of various types of flow in pumps.
- To understand the importance of various types of flow in turbines.

**UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 12**

Units and dimensions- Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, vapor pressure, surface tension and capillarity. Flow characteristics – concept of control volume - application of continuity equation, energy equation and momentum equation.

**UNIT II FLOW THROUGH CIRCULAR CONDUITS 12**

Hydraulic and energy gradient - Laminar flow through circular conduits and circular annuli- Boundary layer concepts – types of boundary layer thickness – Darcy Weisbach equation –friction factor- Moody diagram- commercial pipes- minor losses – Flow through pipes in series and parallel.

**UNIT III DIMENSIONAL ANALYSIS 12**

Need for dimensional analysis – methods of dimensional analysis – Similitude –types of similitude - Dimensionless parameters- application of dimensionless parameters – Model analysis.

**UNIT IV PUMPS 12**

Impact of jets - Euler's equation - Theory of roto-dynamic machines – various efficiencies– velocity components at entry and exit of the rotor- velocity triangles - Centrifugal pumps– working principle  
- work done by the impeller - performance curves - Reciprocating pump- working principle – Rotary pumps –classification.

**UNIT V TURBINES 12**

Classification of turbines – heads and efficiencies – velocity triangles. Axial, radial and mixed flow turbines. Pelton wheel, Francis turbine and Kaplan turbines- working principles - work done by water on the runner – draft tube. Specific speed - unit quantities – performance curves for turbines – governing of turbines.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

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

- Apply mathematical knowledge to predict the properties and characteristics of a fluid.
- Can analyse and calculate major and minor losses associated with pipe flow in piping networks.
- Can mathematically predict the nature of physical quantities
- Can critically analyse the performance of pumps
- Can critically analyse the performance of turbines.

**TEXT BOOK:**

1. Modi P.N. and Seth, S.M. "Hydraulics and Fluid Mechanics", Standard Book House, New Delhi 2013.

**REFERENCES:**

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi



2016

3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, "Fluid Mechanics and Machinery", 2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010

19154C34

**PRODUCTION TECHNOLOGY – I**

**L T P C**  
**4 0 0 4**

**OBJECTIVE:**

- To introduce the concepts of basic manufacturing processes and fabrication techniques, such as metal casting, metal joining, metal forming and manufacture of plastic components.

**UNIT I METAL CASTING PROCESSES**

**12**

Sand Casting : Sand Mould – Type of patterns - Pattern Materials – Pattern allowances –Moulding sand Properties and testing – Cores –Types and applications – Moulding machines– Types and applications; Melting furnaces : Blast and Cupola Furnaces; Principle of special casting processes : Shell - investment – Ceramic mould – Pressure die casting - Centrifugal Casting - CO<sub>2</sub> process – Stir casting; Defects in Sand casting

**UNIT II JOINING PROCESSES**

**12**

Operating principle, basic equipment, merits and applications of: Fusion welding processes: Gas welding - Types – Flame characteristics; Manual metal arc welding – Gas Tungsten arc welding - Gas metal arc welding – Submerged arc welding – Electro slag welding; Operating principle and applications of: Resistance welding - Plasma arc welding – Thermit welding – Electron beam welding – Friction welding and Friction Stir Welding; Brazing and soldering; Weld defects: types, causes and cure.

**UNIT III METAL FORMING PROCESSES**

**12**

Hot working and cold working of metals – Forging processes – Open, impression and closed die forging – forging operations. Rolling of metals– Types of Rolling – Flat strip rolling – shape rolling operations – Defects in rolled parts. Principle of rod and wire drawing – Tube drawing – Principles of Extrusion – Types – Hot and Cold extrusion.

**UNIT IV SHEET METAL PROCESSES**

**12**

Sheet metal characteristics – shearing, bending and drawing operations – Stretch forming operations – Formability of sheet metal – Test methods –special forming processes-Working principle and applications – Hydro forming – Rubber pad forming – Metal spinning– Introduction of Explosive forming, magnetic pulse forming, peen forming, Super plastic forming – Micro forming

**UNIT V MANUFACTURE OF PLASTIC COMPONENTS**

**12**

Types and characteristics of plastics – Moulding of thermoplastics – working principles and typical applications – injection moulding – Plunger and screw machines – Compression moulding, Transfer Moulding – Typical industrial applications – introduction to blow moulding –Rotational moulding – Film blowing – Extrusion – Thermoforming – Bonding of Thermoplastics.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

- CO1 Explain different metal casting processes, associated defects, merits and demerits
- CO2 Compare different metal joining processes.
- CO3 Summarize various hot working and cold working methods of metals.

- CO4 Explain various sheet metal making processes.  
 CO5 Distinguish various methods of manufacturing plastic components.

**TEXT BOOKS:**

1. Hajra Chouldhary S.K and Hajra Choudhury. AK., "Elements of workshop Technology", volume I and II, Media promoters and Publishers Private Limited, Mumbai, 2008
2. Kalpakjian. S, "Manufacturing Engineering and Technology", Pearson Education India Edition, 2013

**REFERENCES:**

1. Gowri P. Hariharan, A.Suresh Babu, "Manufacturing Technology I", Pearson Education, 2008
2. Paul Degarma E, Black J.T and Ronald A. Kosher, "Materials and Processes, in Manufacturing" Eight Edition, Prentice – Hall of India, 1997.
3. Rao, P.N. "Manufacturing Technology Foundry, Forming and Welding", 4<sup>th</sup> Edition, TMH-2013
4. Roy. A. Lindberg, "Processes and Materials of Manufacture", PHI / Pearson education, 2006
5. Sharma, P.C., "A Text book of production Technology", S.Chand and Co. Ltd., 2014.

19154C35	<b>ELECTRICAL DRIVES AND CONTROLS</b>	<b>L T P C</b>
		<b>3 2 0 4</b>

**OBJECTIVES:**

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting D.C motors and induction motors.
- To study the conventional and solid-state drives

**UNIT I INTRODUCTION**

**9+6**

Basic Elements – Types of Electric Drives – factors influencing the choice of electrical drives – heating and cooling curves – Loading conditions and classes of duty – Selection of power rating for drive motors with regard to thermal overloading and Load variation factors

**UNIT II DRIVE MOTOR CHARACTERISTICS**

**9+6**

Mechanical characteristics – Speed-Torque characteristics of various types of load and drive motors – Braking of Electrical motors – DC motors: Shunt, series and compound - single phase and three phase induction motors.

**UNIT III STARTING METHODS**

**9+6**

Types of D.C Motor starters – Typical control circuits for shunt and series motors – Three phase squirrel cage and slip ring induction motors.

#### **UNIT IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES**

**9+6**

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

#### **UNIT V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES**

**9+6**

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

**TOTAL: 75 PERIODS**

#### **OUTCOME:**

- Upon Completion of this subject, the students can able to explain different types of electrical machines and their performance

#### **TEXT BOOKS:**

1. Nagrath .I.J. & Kothari .D.P, “Electrical Machines”, Tata McGraw-Hill, 2006
2. Vedam Subrahmaniam, “Electric Drives (Concepts and Applications)”, Tata McGraw-Hill, 2010

#### **REFERENCES:**

1. Partab. H., “Art and Science and Utilisation of Electrical Energy”, Dhanpat Rai and Sons, 2017
2. Pillai.S.K “A First Course on Electric Drives”, Wiley Eastern Limited, 2012
3. Singh. M.D., K.B.Khanchandani, “Power Electronics”, Tata McGraw-Hill, 2006.

19154L36

#### **PRODUCTION TECHNOLOGY LABORATORY – I**

**L T P C**  
**0 0 3 2**

#### **OBJECTIVE:**

- To Study and practice the various operations that can be performed in lathe, shaper, drilling, milling machines etc. and to equip with the practical knowledge required in the core industries.

#### **LIST OF EXPERIMENTS**

Machining and Machining time estimations for:

1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping
  
8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using Gas Metal Arc Welding/ Arc Welding /Submerged arc welding
10. Preparation of green sand moulds
- 11 Manufacturing of simple sheet metal components using shearing and bending operations.
12. Manufacturing of sheet metal components using metal spinning on a lathe

**TOTAL: 45 PERIODS**

#### **OUTCOMES:**

55  
Upon the completion of this course the students will be able to

- CO1 Demonstrate the safety precautions exercised in the mechanical workshop.
- CO2 Make the workpiece as per given shape and size using Lathe.
- CO3 Join two metals using arc welding.
- CO4 Use sheet metal fabrication tools and make simple tray and funnel.
- CO5 Use different moulding tools, patterns and prepare sand moulds.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S. NO.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
1	Centre Lathes	7 Nos.
2	Horizontal Milling Machine	1 No
3	Vertical Milling Machine	1 No
4	Shaper	1 No.
5	Arc welding transformer with cables and holders	2 Nos
6	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit	1 No
7	Moulding table, Moulding equipments	2 Nos
8	Sheet metal forming tools and equipments	2 Nos.

**OBJECTIVES:**

- To make the students understand and interpret drawings of machine components
- To prepare assembly drawings both manually and using standard CAD packages
- To familiarize the students with Indian Standards on drawing practices and standard components
- To gain practical experience in handling 2D drafting and 3D modeling software systems.

**UNIT I DRAWING STANDARDS & FITS AND TOLERANCES 12**

Code of practice for Engineering Drawing, BIS specifications – Welding symbols, riveted joints, keys, fasteners – Reference to hand book for the selection of standard components like bolts, nuts, screws, keys etc. - Limits, Fits – Tolerancing of individual dimensions – Specification of Fits – Preparation of production drawings and reading of part and assembly drawings, basic principles of geometric dimensioning & tolerancing.

**UNIT II INTRODUCTION TO 2D DRAFTING 13**

- Drawing, Editing, Dimensioning, Layering, Hatching, Block, Array, Detailing, Detailed drawing.
- Bearings - Bush bearing, Plummer block
- Valves – Safety and non-return valves.

**UNIT III 3D GEOMETRIC MODELING AND ASSEMBLY 20**

Sketcher - Datum planes – Protrusion – Holes - Part modeling – Extrusion – Revolve – Sweep – Loft – Blend – Fillet - Pattern – Chamfer - Round - Mirror – Section - Assembly

- Couplings – Flange, Universal, Oldham's, Muff, Gear couplings
- Joints – Knuckle, Gib & cotter, strap, sleeve & cotter joints
- Engine parts – Piston, connecting rod, cross-head (vertical and horizontal), stuffing box, multi-plate clutch
- Miscellaneous machine components – Screw jack, machine vice, tail stock, chuck, vane and gear pump

**TOTAL:45 PERIODS**

**Note:** 25% of assembly drawings must be done manually and remaining 75% of assembly drawings must be done by using any CAD software. The above tasks can be performed manually and using standard commercial 2D / 3D CAD software

**OUTCOMES:**

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

CO1 Follow the drawing standards, Fits and Tolerances

CO2 Re-create part drawings, sectional views and assembly drawings as per standards

**TEXT BOOK:**

1. Gopalakrishna K.R., "Machine Drawing", 22nd Edition, Subhas Stores Books Corner, Bangalore, 2013

**REFERENCES:**

1. N. D. Bhatt and V.M. Panchal, "Machine Drawing", 48th Edition, Charotar Publishers, 2013
2. Junnarkar, N.D., "Machine Drawing", 1st Edition, Pearson Education, 2004
3. N. Siddeshwar, P. Kanniah, V.V.S. Sastri, "Machine Drawing", published by Tata Mc GrawHill, 2006
4. S. Trymbaka Murthy, "A Text Book of Computer Aided Machine Drawing", CBS Publishers, New Delhi, 2007

**OBJECTIVE:**

- To validate the principles studied in theory by performing experiments in the laboratory

**LIST OF EXPERIMENTS**

1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt and DC Series 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. Study of DC & AC Starters

**OUTCOME:**

- Ability to perform speed characteristic of different electrical machine

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS**

<b>S.No.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
1	DC Shunt motor	2
2	DC Series motor	1
3	DC shunt motor-DC Shunt Generator set	1
4	DC Shunt motor-DC Series Generator set	1
5	Single phase transformer	2
6	Three phase alternator	2
7	Three phase synchronous motor	1
8	Three phase Squirrel cage Induction motor	1
9	Three phase Slip ring Induction motor	1

19154L39

**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

<b>19148C41D</b>	<b>STATISTICS AND NUMERICAL METHODS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- 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 solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and 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.

**UNIT I TESTING OF HYPOTHESIS 9+6**

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 II DESIGN OF EXPERIMENTS 9+6**

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2<sup>2</sup> factorial design.

**UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9+6**

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 - Eigen values of a matrix by Power method and Jacobi’s method for symmetric matrices.

**UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9+6**

Lagrange’s and Newton’s divided difference interpolations – Newton’s forward and backward difference interpolation – Approximation of derivatives using interpolation polynomials – Numerical single and double integrations using Trapezoidal and Simpson’s 1/3 rules.

**UNIT V NUMERICAL SOLUTION OF 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.

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

**OUTCOMES :**

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

- 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.
- Appreciate the numerical techniques of interpolation in various intervals and 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

**TEXT BOOKS :**

1. Grewal. B.S. and Grewal. J.S., “Numerical Methods in Engineering and Science ”, 10<sup>th</sup> Edition, Khanna Publishers, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., “Miller and Freund’s Probability and Statistics for Engineers”, Pearson Education, Asia, 8<sup>th</sup> Edition, 2015.

**REFERENCES :**

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9<sup>th</sup> Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia, New Delhi, 2006.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum’s Outlines on 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”, 8<sup>th</sup> Edition, Pearson Education, Asia, 2007.

<b>19154C42</b>	<b>THEORY OF MACHINES-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To understand the basic components and layout of linkages in the assembly of a system machine.
- To understand the principles in analyzing the assembly with respect to the displacement, velocity, and acceleration at any point in a link of a mechanism.
- To understand the motion resulting from a specified set of linkages, design few linkage mechanisms and cam mechanisms for specified output motions.
- To understand the basic concepts of toothed gearing and kinematics of gear trains and the effects of friction in motion transmission and in machine components.

**UNIT I      BASICS OF MECHANISMS**

**9+6**

Classification of mechanisms – Basic kinematic concepts and definitions – Degree of freedom, Mobility – Kutzbach criterion, Gruebler’s criterion – Grashof’s Law – Kinematic inversions of four-bar chain and slider crank chains – Limit positions – Mechanical advantage – Transmission Angle – Description of some common mechanisms – Quick return mechanisms, Straight line generators, Universal Joint – rocker mechanisms.

**UNIT II      KINEMATICS OF LINKAGE MECHANISMS**

**9+6**

Displacement, velocity and acceleration analysis of simple mechanisms – Graphical method– Velocity and acceleration polygons – Velocity analysis using instantaneous centres – kinematic analysis of simple mechanisms – Coincident points – Coriolis component of Acceleration – Introduction to linkage synthesis problem.

**UNIT III KINEMATICS OF CAM MECHANISMS 9+6**

Classification of cams and followers – Terminology and definitions – Displacement diagrams – Uniform velocity, parabolic, simple harmonic and cycloidal motions – Derivatives of follower motions – Layout of plate cam profiles – Specified contour cams – Circular arc and tangent cams – Pressure angle and undercutting – sizing of cams.

**UNIT IV GEARS AND GEAR TRAINS 9+6**

Law of toothed gearing – Involute and cycloidal tooth profiles – Spur Gear terminology and definitions – Gear tooth action – contact ratio – Interference and undercutting. Helical, Bevel, Worm, Rack and Pinion gears [Basics only]. Gear trains – Speed ratio, train value – Parallel axis gear trains – Epicyclic Gear Trains.

**UNIT V FRICTION IN MACHINE ELEMENTS 9+6**

Surface contacts – Sliding and Rolling friction – Friction drives – Friction in screw threads – Bearings and lubrication – Friction clutches – Belt and rope drives – Friction in brakes- Band and Block brakes.

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

**OUTCOMES:**

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

- CO1 Discuss the basics of mechanism
- CO2 Calculate velocity and acceleration in simple mechanisms
- CO3 Develop CAM profiles
- CO4 Solve problems on gears and gear trains
- CO5 Examine friction in machine elements

**TEXT BOOKS:**

1. F.B. Sayyad, “Kinematics of Machinery”, MacMillan Publishers Pvt Ltd., Tech-max Educational resources, 2011.
2. Rattan, S.S, “Theory of Machines”, 4<sup>th</sup> Edition, Tata McGraw-Hill, 2014.
3. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, 4 Edition, Oxford University Press, 2014.

**REFERENCES:**

1. Allen S. Hall Jr., “Kinematics and Linkage Design”, Prentice Hall, 1961
2. Cleghorn. W. L, “Mechanisms of Machines”, Oxford University Press, 2014
3. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines”, 3<sup>rd</sup> Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006.
4. John Hannah and Stephens R.C., "Mechanics of Machines", Viva Low-Prices Student Edition, 1999.
5. Thomas Bevan, "Theory of Machines", 3rd Edition, CBS Publishers and Distributors, 2005.

**OBJECTIVES:**

- To understand the concept and basic mechanics of metal cutting, working of standard machine tools such as lathe, shaping and allied machines, milling, drilling and allied machines, grinding and allied machines and broaching.
- To understand the basic concepts of Computer Numerical Control (CNC) of machine tools and CNC Programming

**UNIT I THEORY OF METAL CUTTING 9**

Mechanics of chip formation, single point cutting tool, forces in machining, Types of chip, cutting tools– nomenclature, orthogonal metal cutting, thermal aspects, cutting tool materials, tool wear, tool life, surface finish, cutting fluids and Machinability.

**UNIT II TURNING MACHINES 9**

Centre lathe, constructional features, specification, operations – taper turning methods, thread cutting methods, special attachments, machining time and power estimation. Capstan and turret lathes- tool layout – automatic lathes: semi automatic – single spindle : Swiss type, automatic screw type – multi spindle:

**UNIT III SHAPER, MILLING AND GEAR CUTTING MACHINES 9**

Shaper - Types of operations. Drilling ,reaming, boring, Tapping. Milling operations-types of milling cutter. Gear cutting – forming and generation principle and construction of gear milling ,hobbing and gear shaping processes –finishing of gears.

**UNIT IV ABRASIVE PROCESS AND BROACHING 9**

Abrasive processes: grinding wheel – specifications and selection, types of grinding process– cylindrical grinding, surface grinding, centreless grinding and internal grinding- Typical applications

– concepts of surface integrity, broaching machines: broach construction – push, pull, surface and continuous broaching machines

**UNIT V CNC MACHINING 9**

Numerical Control (NC) machine tools – CNC types, constructional details, special features, machining centre, part programming fundamentals CNC – manual part programming – micromachining – wafer machining.

**TOTAL : 45 PERIODS****OUTCOMES:**

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

- CO1 Explain the mechanism of material removal processes.
- CO2 Describe the constructional and operational features of centre lathe and other special purpose lathes.
- CO3 Describe the constructional and operational features of shaper, planner, milling, drilling, sawing and broaching machines.
- CO4 Explain the types of grinding and other super finishing processes apart from gear manufacturing processes.
- CO5 Summarize numerical control of machine tools and write a part program.

**TEXT BOOKS:**

1. Hajra Choudhury, "Elements of Workshop Technology", Vol.II., Media Promoters 2014
2. Rao. P.N “Manufacturing Technology - Metal Cutting and Machine Tools”, 3<sup>rd</sup> Edition, Tata

McGraw-Hill, New Delhi, 2013.

**REFERENCES:**

1. Richerd R Kibbe, John E. Neely, Roland O. Merges and Warren J.White “Machine Tool Practices”, Prentice Hall of India, 1998
2. Geoffrey Boothroyd, "Fundamentals of Metal Machining and Machine Tools", Mc Graw Hill, 1984
3. HMT, "Production Technology", Tata McGraw Hill, 1998.
4. Roy. A.Lindberg, “Process and Materials of Manufacture,” Fourth Edition, PHI/Pearson Education 2006.

**OBJECTIVE:**

- To impart knowledge on the structure, properties, treatment, testing and applications of metals and non-metallic materials so as to identify and select suitable materials for various engineering applications.

**UNIT I ALLOYS AND PHASE DIAGRAMS 9**

Constitution of alloys – Solid solutions, substitutional and interstitial – phase diagrams, Isomorphous, eutectic, eutectoid, peritectic, and peritectoid reactions, Iron – carbon equilibrium diagram. Classification of steel and cast Iron microstructure, properties and application.

**UNIT II HEAT TREATMENT 9**

Definition – Full annealing, stress relief, recrystallisation and spheroidising – normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR – Hardenability, Jominy end quench test - Austempering, martempering – case hardening, carburizing, Nitriding, cyaniding, carbonitriding – Flame and Induction hardening – Vacuum and Plasma hardening. .

**UNIT III FERROUS AND NON-FERROUS METALS 9**

Effect of alloying additions on steel-  $\alpha$  and  $\beta$  stabilisers– stainless and tool steels – HSLA, Maraging steels – Cast Iron - Grey, white, malleable, spheroidal – alloy cast irons, Copper and copper alloys – Brass, Bronze and Cupronickel – Aluminium and Al-Cu – precipitation strengthening treatment – Bearing alloys, Mg-alloys, Ni-based super alloys and Titanium alloys.

**UNIT IV NON-METALLIC MATERIALS 9**

Polymers – types of polymer, commodity and engineering polymers – Properties and applications of various thermosetting and thermoplastic polymers (PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE, Polymers – Urea and Phenol formaldehydes)- Engineering Ceramics – Properties and applications of Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub>, PSZ and SIALON –Composites- Classifications- Metal Matrix and FRP - Applications of Composites.

**UNIT V MECHANICAL PROPERTIES AND DEFORMATION MECHANISMS 9**

Mechanisms of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell), hardness tests, Impact test Izod and Charpy, fatigue and creep failure mechanisms.

**TOTAL: 45 PERIODS****OUTCOMES**

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

- CO1 Explain alloys and phase diagram, Iron-Iron carbon diagram and steel classification.
- CO2 Explain isothermal transformation, continuous cooling diagrams and different heat treatment processes.
- CO3 Clarify the effect of alloying elements on ferrous and non-ferrous metals
- CO4 Summarize the properties and applications of non metallic materials.
- CO5 Explain the testing of mechanical properties. .

**TEXT BOOKS:**

- Avner, S.H., “Introduction to Physical Metallurgy”, McGraw Hill Book Company, 1997.
- Williams D Callister, “Material Science and Engineering” Wiley India Pvt Ltd, Revised Indian Edition 2014

## REFERENCES:

1. Kenneth G. Budinski and Michael K. Budinski, "Engineering Materials", Prentice Hall of India Private Limited, 2010.
2. Raghavan. V, "Materials Science and Engineering", Prentice Hall of India Pvt. Ltd., 2015.
3. U.C. Jindal : Material Science and Metallurgy, "Engineering Materials and Metallurgy", First Edition, Dorling Kindersley, 2012
4. Upadhyay. G.S. and Anish Upadhyay, "Materials Science and Engineering", Viva Books Pvt. Ltd., New Delhi, 2006.

**19154C45**

## **STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS**

**L T P C**

**3 2 0 4**

## OBJECTIVES:

- To understand the concepts of stress, strain, principal stresses and principal planes.
- To study the concept of shearing force and bending moment due to external loads in determinate beams and their effect on stresses.
- To determine stresses and deformation in circular shafts and helical spring due to torsion.
- To compute slopes and deflections in determinate beams by various methods.
- To study the stresses and deformations induced in thin and thick shells.

### **UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9+6**

Rigid bodies and deformable solids – Tension, Compression and Shear Stresses – Deformation of simple and compound bars – Thermal stresses – Elastic constants – Volumetric strains – Stresses on inclined planes – principal stresses and principal planes – Mohr's circle of stress.

### **UNIT II TRANSVERSE LOADING ON BEAMS AND STRESSES IN BEAM 9+6**

Beams – types transverse loading on beams – Shear force and bending moment in beams – Cantilevers – Simply supported beams and over – hanging beams. Theory of simple bending – bending stress distribution – Load carrying capacity – Proportioning of sections – Flitched beams – Shear stress distribution.

### **UNIT III TORSION 9+6**

Torsion formulation stresses and deformation in circular and hollow shafts – Stepped shafts – Deflection in shafts fixed at the both ends – Stresses in helical springs – Deflection of helical springs, carriage springs.

### **UNIT IV DEFLECTION OF BEAMS 9+6**

Double Integration method – Macaulay's method – Area moment method for computation of slopes and deflections in beams – Conjugate beam and strain energy – Maxwell's reciprocal theorems.

### **UNIT V THIN CYLINDERS, SPHERES AND THICK CYLINDERS 9+6**

Stresses in thin cylindrical shell due to internal pressure circumferential and longitudinal stresses and deformation in thin and thick cylinders – spherical shells subjected to internal pressure – Deformation in spherical shells – Lamé's theorem.

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



## OUTCOMES

Students will be able to

- Understand the concepts of stress and strain in simple and compound bars, the importance of principal stresses and principal planes.
- Understand the load transferring mechanism in beams and stress distribution due to shearing force and bending moment.
- Apply basic equation of simple torsion in designing of shafts and helical spring
- Calculate the slope and deflection in beams using different methods.
- Analyze and design thin and thick shells for the applied internal and external pressures.

## TEXT BOOKS:

1. Bansal, R.K., "Strength of Materials", Laxmi Publications (P) Ltd., 2016
2. Jindal U.C., "Strength of Materials", Asian Books Pvt. Ltd., New Delhi, 2009

## REFERENCES:

1. Egor. P.Popov "Engineering Mechanics of Solids" Prentice Hall of India, New Delhi, 2002
2. Ferdinand P. Beer, Russell Johnson, J.r. and John J. Dewole "Mechanics of Materials", Tata McGraw Hill Publishing 'co. Ltd., New Delhi, 2005.
3. Hibbeler, R.C., "Mechanics of Materials", Pearson Education, Low Price Edition, 2013
4. Subramanian R., "Strength of Materials", Oxford University Press, Oxford Higher Education Series, 2010.

**19154C46**

**THERMAL ENGINEERING - I**

L	T	P	C
3	2	0	4

## OBJECTIVES:

- To integrate the concepts, laws and methodologies from the first course in thermodynamics into analysis of cyclic processes
- To apply the thermodynamic concepts into various thermal application like IC engines, Steam.
- Turbines, Compressors and Refrigeration and Air conditioning systems

(Use of standard refrigerant property data book, Steam Tables, Mollier diagram and Psychrometric chart permitted)

## **UNIT I GAS AND STEAM POWER CYCLES 9+6**

Air Standard Cycles - Otto, Diesel, Dual, Brayton – Cycle Analysis, Performance and Comparison – Rankine, reheat and regenerative cycle.

## **UNIT II RECIPROCATING AIR COMPRESSOR 9+6**

Classification and comparison, working principle, work of compression - with and without clearance, Volumetric efficiency, Isothermal efficiency and Isentropic efficiency. Multistage air compressor with Intercooling. Working principle and comparison of Rotary compressors with reciprocating air compressors.

## **UNIT III INTERNAL COMBUSTION ENGINES AND COMBUSTION 9+6**

IC engine – Classification, working, components and their functions. Ideal and actual : Valve and port timing diagrams, p-v diagrams- two stroke & four stroke, and SI & CI engines – comparison. Geometric, operating, and performance comparison of SI and CI engines. Desirable properties and

qualities of fuels. Air-fuel ratio calculation – lean and rich mixtures. Combustion in SI & CI Engines – Knocking – phenomena and control.

**UNIT IV INTERNAL COMBUSTION ENGINE PERFORMANCE AND SYSTEMS 9+6**

Performance parameters and calculations. Morse and Heat Balance tests. Multipoint Fuel Injection system and Common Rail Direct Injection systems. Ignition systems – Magneto, Battery and Electronic. Lubrication and Cooling systems. Concepts of Supercharging and Turbocharging – Emission Norms.

**UNIT V GAS TURBINES 9+6**

Gas turbine cycle analysis – open and closed cycle. Performance and its improvement - Regenerative, Intercooled, Reheated cycles and their combinations. Materials for Turbines.

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

**OUTCOMES:**

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

- CO1 Apply thermodynamic concepts to different air standard cycles and solve problems.
- CO2 Solve problems in single stage and multistage air compressors
- CO3 Explain the functioning and features of IC engines, components and auxiliaries.
- CO4 Calculate performance parameters of IC Engines.
- CO5 Explain the flow in Gas turbines and solve problems.

**TEXT BOOKS:**

1. Kothandaraman.C.P., Domkundwar. S,Domkundwar. A.V., “A course in thermal Engineering”, Fifth Edition, ”Dhanpat Rai & sons , 2016
2. Rajput. R. K., “Thermal Engineering” S.Chand Publishers, 2017

**REFERENCES:**

2. Arora.C.P, ”Refrigeration and Air Conditioning ,” Tata McGraw-Hill Publishers 2008
3. Ganesan V..” Internal Combustion Engines” , Third Edition, Tata McGraw-Hill 2012
4. Ramalingam. K.K., "Thermal Engineering", SCITECH Publications (India) Pvt. Ltd., 2009.
5. Rudramoorthy, R, “Thermal Engineering “,Tata McGraw-Hill, New Delhi,2003
6. Sarkar, B.K, ”Thermal Engineering” 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**

<b>S. NO.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
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

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**THERMAL ENGINEERING – II**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>2</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

- To apply the thermodynamic concepts for Nozzles, Boilers, Turbines, and Refrigeration & Air Conditioning Systems.
- To understand the concept of utilising residual heat in thermal systems.

**UNIT I STEAM NOZZLE 9+6**

Types and Shapes of nozzles, Flow of steam through nozzles, Critical pressure ratio, Variation of mass flow rate with pressure ratio. Effect of friction. Metastable flow.

**UNIT II BOILERS 9+6**

Types and comparison. Mountings and Accessories. Fuels - Solid, Liquid and Gas. Performance calculations, Boiler trial.

**UNIT III STEAM TURBINES 9+6**

Types, Impulse and reaction principles, Velocity diagrams, Work done and efficiency – optimal operating conditions. Multi-staging, compounding and governing.

**UNIT IV COGENERATION AND RESIDUAL HEAT RECOVERY 9+6**

Cogeneration Principles, Cycle Analysis, Applications, Source and utilisation of residual heat. Heat pipes, Heat pumps, Recuperative and Regenerative heat exchangers. Economic Aspects.

**UNIT V REFRIGERATION AND AIR – CONDITIONING 9+6**

Vapour compression refrigeration cycle, Effect of Superheat and Sub-cooling, Performance calculations, Working principle of air cycle, vapour absorption system, and Thermoelectric refrigeration. Air conditioning systems, concept of RSHF, GSHF and ESHF, Cooling load calculations. Cooling towers – concept and types.

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

**OUTCOMES:**

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

- CO1 Solve problems in Steam Nozzle
- CO2 Explain the functioning and features of different types of Boilers and auxiliaries and calculate performance parameters.
- CO3 Explain the flow in steam turbines, draw velocity diagrams for steam turbines and solve problems.
- CO4 Summarize the concept of Cogeneration, Working features of Heat pumps and Heat exchangers
- CO5 Solve problems using refrigerant table / charts and psychrometric charts



**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”, 4<sup>th</sup> 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”, 1<sup>st</sup> 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”, 4<sup>th</sup> Edition, Wiley, 2005
6. Sundararajamoorthy T. V. Shanmugam .N, “Machine Design”, Anuradha Publications, Chennai, 2015.

**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", 5<sup>th</sup> 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 understand the force-motion relationship in components subjected to external forces and analysis of standard mechanisms.
- To understand the undesirable effects of unbalances resulting from prescribed motions in mechanism.
- To understand the effect of Dynamics of undesirable vibrations.
- To understand the principles in mechanisms used for speed control and stability control.

**UNIT I FORCE ANALYSIS****9+6**

Dynamic force analysis – Inertia force and Inertia torque– D Alembert’s principle –Dynamic Analysis in reciprocating engines – Gas forces – Inertia effect of connecting rod– Bearing loads – Crank shaft torque – Turning moment diagrams –Fly Wheels – Flywheels of punching presses– Dynamics of Cam- follower mechanism.

**UNIT II BALANCING****9+6**

Static and dynamic balancing – Balancing of rotating masses – Balancing a single cylinder engine – Balancing of Multi-cylinder inline, V-engines – Partial balancing in engines – Balancing of linkages – Balancing machines-Field balancing of discs and rotors.

**UNIT III FREE VIBRATION****9+6**

Basic features of vibratory systems – Degrees of freedom – single degree of freedom – Free vibration– Equations of motion – Natural frequency – Types of Damping – Damped vibration– Torsional vibration of shaft – Critical speeds of shafts – Torsional vibration – Two and three rotor torsional systems.

**UNIT IV FORCED VIBRATION****9+6**

Response of one degree freedom systems to periodic forcing – Harmonic disturbances – Disturbance caused by unbalance – Support motion –transmissibility – Vibration isolation vibration measurement.

**UNIT V MECHANISM FOR CONTROL****9+6**

Governors – Types – Centrifugal governors – Gravity controlled and spring controlled centrifugal governors – Characteristics – Effect of friction – Controlling force curves. Gyroscopes –Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in Automobiles, ships and airplanes.

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

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

- CO1 Calculate static and dynamic forces of mechanisms.
- CO2 Calculate the balancing masses and their locations of reciprocating and rotating masses.
- CO3 Compute the frequency of free vibration.
- CO4 Compute the frequency of forced vibration and damping coefficient.
- CO5 Calculate the speed and lift of the governor and estimate the gyroscopic effect on automobiles, ships and airplanes.

**TEXT BOOKS:**

1. F. B. Sayyad, “Dynamics of Machinery”, McMillan Publishers India Ltd., Tech-Max Educational resources, 2011.
2. Rattan, S.S, “Theory of Machines”, 4<sup>th</sup> Edition, Tata McGraw-Hill, 2014.
3. Uicker, J.J., Pennock G.R and Shigley, J.E, “Theory of Machines and Mechanisms”, 4<sup>th</sup>

Edition, Oxford University Press, 2014.

## REFERENCES:

1. Cleghorn. W. L, "Mechanisms of Machines", Oxford University Press, 2014
2. Ghosh. A and Mallick, A.K., "Theory of Mechanisms and Machines", 3<sup>rd</sup> Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006.
3. Khurmi, R.S., "Theory of Machines", 14<sup>th</sup> Edition, S Chand Publications, 2005.
4. Rao.J.S. and Dukkupati.R.V. "Mechanisms and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
5. Robert L. Norton, "Kinematics and Dynamics of Machinery", Tata McGraw-Hill, 2009.
6. V.Ramamurthi, "Mechanics of Machines", Narosa Publishing House, 2002.

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**THEORY OF MACHINES LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

## OBJECTIVES:

- To supplement the principles learnt in kinematics and Dynamics of Machinery.
- To understand how certain measuring devices are used for dynamic testing.

## LIST OF EXPERIMENTS

1. a) Study of gear parameters.  
b) Experimental study of velocity ratios of simple, compound, Epicyclic and differential gear trains.
2. a) Kinematics of Four Bar, Slider Crank, Crank Rocker, Double crank, Double rocker, Oscillating cylinder Mechanisms.  
b) Kinematics of single and double universal joints.
3. a) Determination of Mass moment of inertia of Fly wheel and Axle system.  
b) Determination of Mass Moment of Inertia of axisymmetric bodies using Turn Table apparatus. c) Determination of Mass Moment of Inertia using bifilar suspension and compound pendulum.
4. Motorized gyroscope – Study of gyroscopic effect and couple.
5. Governor - Determination of range sensitivity, effort etc., for Watts, Porter, Proell, and Hartnell Governors.
6. Cams – Cam profile drawing, Motion curves and study of jump phenomenon
7. a) Single degree of freedom Spring Mass System – Determination of natural Frequency and verification of Laws of springs – Damping coefficient determination. b) Multi degree freedom suspension system – Determination of influence coefficient.
8. a) Determination of torsional natural frequency of single and Double Rotor systems.- Undamped and Damped Natural frequencies.  
b) Vibration Absorber – Tuned vibration absorber.
9. Vibration of Equivalent Spring mass system – undamped and damped vibration.
10. Whirling of shafts – Determination of critical speeds of shafts with concentrated loads.
11. a) Balancing of rotating masses. (b) Balancing of reciprocating masses.
12. a) Transverse vibration of Free-Free beam – with and without concentrated masses. b) Forced Vibration of Cantilever beam – Mode shapes and natural frequencies.  
c) Determination of transmissibility ratio using vibrating table.

**TOTAL : 60 PERIODS**

## OUTCOMES

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

CO1 Explain gear parameters, kinematics of mechanisms, gyroscopic effect and working of lab equipments.

CO2 Determine mass moment of inertia of mechanical element, governor effort and range sensitivity, natural frequency and damping coefficient, torsional frequency, critical speeds of shafts, balancing mass of rotating and reciprocating masses, and transmissibility ratio.

### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
1	Cam follower setup.	1 No.
2	Motorised gyroscope.	1 No.
3	Governor apparatus - Watt, Porter, Proell and Hartnell governors.	1 No.
4	Whirling of shaft apparatus.	1 No.
5	Dynamic balancing machine.	1 No.
6	Two rotor vibration setup.	1 No.
7	Spring mass vibration system.	1 No.

8	Torsional Vibration of single rotor system setup.	1 No.
9	Gear Models	1 No.
10	Kinematic Models to study various mechanisms.	1 No.
11	Turn table apparatus.	1 No.
12	Transverse vibration setup of a) cantilever	1 No.

**OBJECTIVES:**

- To study the value 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

**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.

**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”, 4<sup>th</sup> Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett “Mechanical Engineering Design”, 8<sup>th</sup> Edition, Tata McGraw-Hill, 2008.

**REFERENCES:**

1. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, “Design of Machine Elements” 8<sup>th</sup> 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”, 4<sup>th</sup> Edition, Wiley, 2005
5. Sundararamoorthy 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:**

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 McMahan 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 understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.
- To learn the thermal analysis and sizing of heat exchangers and to understand the basic concepts of mass transfer.  
(Use of standard HMT data book permitted)

**UNIT I CONDUCTION****9+6**

General Differential equation of Heat Conduction– Cartesian and Polar Coordinates – One Dimensional Steady State Heat Conduction — plane and Composite Systems – Conduction with Internal Heat Generation – Extended Surfaces – Unsteady Heat Conduction – Lumped Analysis – Semi Infinite and Infinite Solids –Use of Heisler’s charts.

**UNIT II CONVECTION****9+6**

Free and Forced Convection - Hydrodynamic and Thermal Boundary Layer. Free and Forced Convection during external flow over Plates and Cylinders and Internal flow through tubes .

**UNIT III PHASE CHANGE HEAT TRANSFER AND HEAT EXCHANGERS****9+6**

Nusselt’s theory of condensation - Regimes of Pool boiling and Flow boiling. Correlations in boiling and condensation. Heat Exchanger Types - Overall Heat Transfer Coefficient – Fouling Factors - Analysis – LMTD method - NTU method.

**UNIT IV RADIATION****9+6**

Black Body Radiation – Grey body radiation - Shape Factor – Electrical Analogy – Radiation Shields. Radiation through gases.

**UNIT V MASS TRANSFER****9+6**

Basic Concepts – Diffusion Mass Transfer – Fick’s Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations.

**TOTAL : 75 PERIODS****OUTCOMES:**

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

- CO1 Apply heat conduction equations to different surface configurations under steady state and transient conditions and solve problems
- CO2 Apply free and forced convective heat transfer correlations to internal and external flows through/over various surface configurations and solve problems
- CO3 Explain the phenomena of boiling and condensation, apply LMTD and NTU methods of thermal analysis to different types of heat exchanger configurations and solve problems
- CO4 Explain basic laws for Radiation and apply these principles to radiative heat transfer between different types of surfaces to solve problems
- CO5 Apply diffusive and convective mass transfer equations and correlations to solve problems for different applications

**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.

**19154C65**

**HYDRAULICS AND PNEUMATICS**

**L T P C**  
**3 0 0 3**

**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**

99

- 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**

<b>S.No.</b>	<b>Description of Equipment</b>	<b>Qty</b>
<b>HARDWARE</b>		
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
<b>SOFTWARE</b>		
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



**19154L68**

**DESIGN AND FABRICATION PROJECT**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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.

**19154L69**

**PROFESSIONAL COMMUNICATION**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**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.

**19154L79**

**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:**

- 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.

**19154C72**

**PROCESS PLANNING AND COST ESTIMATION**

L	T	P	C
3	2	0	4

**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”, 9<sup>th</sup> 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.

## MECHATRONICS

19154C73

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.



**19154L77**

**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**

<b>S. NO.</b>	<b>NAME OF THE EQUIPMENT</b>	<b>Qty.</b>
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.

**19154L79**

**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, 10<sup>th</sup> 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", 7<sup>th</sup> Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999
- 5.

## ELECTIVE – I ( VI SEMESTER)

<b>19154E66A</b>	<b>AUTOMOBILE ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### 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", 3<sup>rd</sup> 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, TiO<sub>2</sub>,MgO, ZrO<sub>2</sub>, NiO, nanoalumina, CaO, AgTiO<sub>2</sub>, 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.

19154E74A

**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

19154E74B

**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", 8<sup>th</sup> 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”, 5<sup>th</sup> 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](http://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  | 131 |

- 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.



19154E82A

**PRODUCTION PLANNING AND CONTROL**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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”, 2<sup>nd</sup> Edition, Oxford university press, 2007.
5. Melynk, Denzler, “ Operations management – A value driven approach” Irwin Mcgraw hill.
6. Norman Gaither, G. Frazier, “Operations Management” 9<sup>th</sup> 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” 1<sup>st</sup> Edition, Excel books 2007

19154E82B

**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](http://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](http://www.onlineethics.org)
2. [www.nspe.org](http://www.nspe.org)
3. [www.globalethics.org](http://www.globalethics.org)
4. [www.ethics.org](http://www.ethics.org)

## OPEN ELECTIVE-I

<b>19150FE54A</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### 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.

140

**TOTAL : 45 PERIODS**



**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.

19150FE54B

**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:**

142

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.

<b>19152FE54A</b>	<b>BASICS OF BIOMEDICAL INSTRUMENTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- 
- To study about the different bio potential 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
- To learn the different measurement techniques for non-physiological parameters.
- To familiarize the different biochemical measurements.
- 

**UNIT I BIO POTENTIAL GENERATION AND ELECTRODES TYPES 9**

Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes 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’s 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 student should be able to:**

- 
- To Learn the different bio potential and its propagation.
- CO2: To get Familiarize the different electrode placement for various physiological recording
- CO3: Students will be able design bio amplifier for various physiological recording
- CO4: Students will understand various technique 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. 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)

<b>19153FE54B</b>	<b>ENERGY CONSERVATION AND MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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

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**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 Volumes) available at [www.energymanager training.com,a](http://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.

19154FE54A

**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.

<b>19155FE54A</b>	<b>AIR POLLUTION AND CONTROL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.
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**TEXTBOOKS:** 154

- 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.

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**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:**

**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

19150FE74A

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”, 2<sup>nd</sup> Edition, Pearson Education, 1997.
2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming Language”, 2<sup>nd</sup> 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”, 4<sup>th</sup> 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", 4<sup>TH</sup> Edition, McGraw Hill, 2016.

**REFERENCES:**

1. Donald A Neaman, "Semiconductor Physics and Devices", 4<sup>th</sup> Edition, McGraw Hill, 2012.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11<sup>th</sup> Edition, 2014.
3. Bhattacharya and Sharma, "Solid State Electronic Devices", 2<sup>nd</sup> Edition, Oxford University Press, 2014.
4. R.S.Sedha, "A Textbook of Electronic Devices and Circuits", 2<sup>nd</sup> Edition, S.Chand Publications, 2008.
5. David A. Bell, "Electronic Devices and Circuits", 5<sup>th</sup> 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 inc, 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”, 4<sup>th</sup> ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., “Industrial Water Pollution Control”, 2<sup>nd</sup>Edn., McGraw Hill Inc., 1989.

## REFERENCES

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

## SEMESTER – I

Sl. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19148S11P	Transforms & Partial Differential Equations	3	1	0	4
2	19154H12P	Electrical drives and controls	3	0	0	3
3	19154H13P	Engineering Thermodynamics	3	1	0	4
4	19154H14P	Fluid Mechanics and Machinery	3	1	0	4
5	19154H15P	Foundry And Welding Technology	4	0	0	4
Total No of Credits						19

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

## SEMESTER – II

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	

1	19148S21P	Numerical Methods	3	1	0	4
2	19154H22P	Machine Tool Technology	3	0	0	3
3	19154H23P	Thermal Engineering	3	1	0	4
4	19154H24P	Strength of Materials	3	1	0	4
5	19154H25P	Engineering Materials and Metallurgy	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	19154H32P	Kinematics of Machinery	3	1	0	4
3	19154H33P	Production Planning and Control	4	0	0	4
4	19154H34P	Engineering Metrology and Measurements	4	0	0	4
5	19154L35P	Computer Aided Simulation and Analysis Laboratory	0	0	3	2
Total No of Credits						18

### SEMESTER –IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19154H41P	Power Plant Engineering	4	0	0	4
2	19154H42P	Dynamics of Machinery	3	1	0	4
3	19154H43P	Design of Machine Elements	3	1	0	4
4	19154E44-P	Elective -I	4	0	0	4
5	19154L45P	Dynamics 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	
169						

1	19154H51P	Heat and Mass Transfer	3	1	0	4
2	19154H52P	Design of Transmission Systems	3	1	0	4
3	19154H53P	Automobile Engineering	4	0	0	4
4	19154E54-P	Elective-II	4	0	0	4
5	19154L55P	Heat Transfer Laboratory	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	19154H61P	Finite Elements Analysis	3	1	0	4
2	19154H62P	Mechatronics	4	0	0	4
3	19154H63P	Computer Integrated Manufacturing	4	0	0	4
4	19154E64-P	Elective-III	4	0	0	4
5	19154L65P	Mechatronics Laboratory	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	19160S71P	Total Quality Management	3	0	0	3
2	19154H72P	Process Planning and Cost Estimation	3	1	0	4
3	19154H73P	Applied Hydraulics and Pneumatics	4	0	0	4
4	19154E74-P	Elective-IV	3	0	0	3
5	19154P75P	Project Work	0	0	12	6
Total No of Credits						20

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

TOTAL NO OF CREDITS FROM SEMESTER I TO VII – 130

LIST OF ELECTIVES  
ELECTIVE I

SEMESTER – IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19154E44AP	Gas Dynamics and Jet Propulsion	4	0	0	4
2	19154E44BP	Refrigeration and Air Conditioning	4	0	0	4
3	19154E44CP	Non Destructive Testing	4	0	0	4
4	19154E44DP	Renewable Sources of Energy	4	0	0	4

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

ELECTIVE II  
SEMESTER – V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19154E54AP	Environmental Science and Engineering	4	0	0	4
2	19154E54BP	Composite Materials	4	0	0	4
3	19154E54CP	Robotics	4	0	0	4
4	19154E54DP	Design of Jigs, Fixtures and Press Tools	4	0	0	4

EMPLOYABILITY

ENTREPRENEURSHIP

SKILL DEVELOPMENT

**ELECTIVE III**  
**SEMESTER – VI**

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19154E64AP	Principles of Management	4	0	0	4
2	19154E64BP	Nuclear Engineering	4	0	0	4
3	19154E64CP	Intellectual Property Rights	4	0	0	4
4	19148E64DP	Mathematics for Industrial Operations	4	0	0	4

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**ELECTIVE IV**  
**SEMESTER – VII**

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	19154E74AP	Quality Control and Reliability Engineering	3	0	0	3
2	19154E74BP	Vibration and Noise Control	3	0	0	3
3	19154E74CP	Unconventional Machining Process	3	0	0	3
4	19154E74DP	Industrial Engineering	3	0	0	3

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**19148C11P TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS**



**UNIT I PARTIAL DIFFERENTIAL EQUATIONS** **9 + 3**

Charpits method- Lagrange's linear equation – Linear partial differential equations of second and higher order with constant coefficients.

**UNIT II FOURIER SERIES** **9 + 3**

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 BOUNDARY VALUE PROBLEMS** **9 + 3**

Classification of second order quasi linear partial differential equations – 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.

**UNIT IV FOURIER TRANSFORM** **9 + 3**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

**UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS** **9 + 3**

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

**TUTORIAL 15**

**TOTAL : 60**

**TEXT BOOKS**

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. 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 Ramaniah, 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.

**19153C12P ELECTRICAL DRIVES AND CONTROLS**

**UNIT-I D.C. MACHINES** **(9)**

Principle of operation, Construction, Method of Excitation, Characteristics of d.c shunt, series

, compound generator, emf equation, application. Characteristics of d.c shunt, series, compound motor, torque equation, application, Types of d.c motor starters.

**UNIT-II A.C. MACHINES (9)**

Principle of operation, Construction of Induction and Synchronous machines- Characteristics and its applications. Starters for induction machines.

**UNIT-III (9)**

Basic elements-types of drives-factors influencing the choice of electrical drives-heating and cooling curves-loading conditions and classes of duty-selection of power rating for drive motors with regard to thermal overloading and load variation factors.

**UNIT-IV CONVENTIONAL AND SOLID STATE SPEED CONTROL OF D.C. DRIVES (9)**

Speed control of DC series and shunt motors – Armature and field control, Ward-Leonard control system - Using controlled rectifiers and DC choppers –applications.

**UNIT-V CONVENTIONAL AND SOLID STATE SPEED CONTROL OF A.C. DRIVES (9)**

Speed control of three phase induction motor – Voltage control, voltage / frequency control, slip power recovery scheme – Using inverters and AC voltage regulators – applications.

**Total Hours : 45**

**TEXT BOOKS**

1. VEDAM SUBRAHMANYAM, “Electric Drives (concepts and applications)”, Tata McGraw-Hill, 2001
2. NAGRATH.I.J. & KOTHARI.D.P, “Electrical Machines”, Tata McGraw-Hill, 1998

**REFERENCES**

1. PILLAI.S.K “A first course on Electric drives”, Wiley Eastern Limited, 1998
2. M.D.SINGH, K.B.KHANCHANDANI, “Power Electronics”, Tata McGraw-Hill, 1998

**19154C13P ENGINEERING THERMODYNAMICS**

**UNIT- I: BASIC CONCEPTS 9**

Basic concepts - macroscopic approach, thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work, Zeroth law of thermodynamics – concept of temperature and heat.. First law of thermodynamics – application to closed and open systems, internal energy, specific heat capacities, enthalpy, steady flow process with reference to various thermal equipments.

**UNIT – II: SECOND LAW, ENTROPY AND AVAILABILITY 9**

Second law of thermodynamics – Kelvin’s and Clausius statements of second law. Reversibility and irreversibility. Carnot cycle, reversed carnot cycle, efficiency, COP. Clausius inequality, concept of entropy, entropy of ideal gas, principle of increase of entropy – Carnot theorem

**UNIT – III: STEAM POWER CYCLE 9**

Properties of pure substances – Thermodynamic properties of pure substances in solid, liquid and

vapour phases, phase rule, P-V, P-T, T-V, T-S, H-S diagrams, PVT surfaces, thermodynamic properties of steam. Calculations of work done and heat transfer in non-flow and flow processes. Standard Rankine cycle, Reheat and regenerative cycle.

**UNIT – IV : THERMODYNAMIC RELATIONS**

**9**

Gas mixtures – Properties of ideal and real gases, equation of state, Vander Waal's equation of states, compressibility, compressibility chart. Exact differentials, Maxwell relations, Clausius Clapeyron equations, Joule Thomson Coefficient.

**UNIT – V: PSYCHROMETRY**

**9**

Psychrometry and psychrometric charts, property calculations of air vapour mixtures. Psychrometric process – Sensible heat exchange processes. Latent heat exchange processes. Adiabatic mixing, evaporative cooling, problems.

**TUTORIALS 15**

**TOTAL HOURS: 60**

(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant property tables are permitted)

**TEXT BOOKS**

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi, 1998.
2. Cengel, "Thermodynamics" An Engineering Approach, Third Edition – 2003, Tata Mc Graw Hill, New Delhi.

**REFERENCES**

1. Holman.J.P., "Thermodynamics", 3<sup>rd</sup> Ed. McGraw-Hill, 1995.
2. Arora C.P, " Thermodynamics", Tata McGraw-Hill, New Delhi, 2003.
3. Sri Vastava R.C, Saha S. K, Jan A. K, " Thermodynamics" Prentice Hall of India, New Delhi, 2004.

**19154C14P FLUID MECHANICS AND MACHINERY**

**1. BASIC CONCEPTS AND PROPERTIES**

**6**

Fluid – definition - Properties of fluids - density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressures - pressure measurements by manometers and pressure gauges.

**2. KINEMATICS OF FLUID AND FLUID DYNAMICS**

**12**

Fluid Kinematics - Flow visualization - lines of flow - types of flow - velocity field and acceleration - continuity equation (one and three dimensional differential forms)- stream line, streak line and path line (definitions only)-stream function and velocity potential function (definitions only)- Euler's equation along a streamline - Bernoulli's equation – applications - Venturi meter, Orifice meter, Pitot tube - dimensional analysis - Buckingham's  $\pi$  theorem-applications - similarity laws and models.

**3. INCOMPRESSIBLE FLUID FLOW**

**12**

Viscous flow - Navier-Stoke's equation (Statement only) - Shear stress, pressure gradient relationship - laminar flow between parallel plates - Laminar flow through circular tubes (Hagen poiseulle's) - Hydraulic and energy gradient (descriptive treatment only) - flow through pipes - Darcy -weisback's equation - pipe roughness -friction factor- Moody's diagram-minor losses - flow through pipes in series and in parallel - Boundary layer (definition only)

**4. HYDRAULIC TURBINES**

**8**

175

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines -

Construction of velocity vector diagrams - head and specific work - components of energy transfer - degree of reaction.

Hydro turbines: definition and classifications - Pelton turbine - Francis turbine - propeller turbine - Kaplan turbine - working principles - velocity triangles - work done - specific speed - efficiencies - performance curve for turbines.

## **5. HYDRAULIC PUMPS**

**7**

Pumps: definition and classifications - Centrifugal pump: classifications, working principle, velocity triangles, specific speed, efficiency and performance curves - Reciprocating pump: classification, working principle, indicator diagram, performance curves - cavitations in pumps - rotary pumps: working principles of gear and vane pumps

**TUTORIALS 15**

**TOTAL : 60**

### **TEXT BOOKS**

Streeter, V.L., and Wylie, E.B., "Fluid Mechanics", McGraw-Hill, 1983.

Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd, New Delhi (7<sup>th</sup> edition), 1995.

Vasandani, V.P., "Hydraulic Machines - Theory and Design", Khanna Publishers.1992

### **REFERENCES**

1. Bansal, R.K., "Fluid Mechanics and Hydraulics Machines", (5<sup>th</sup> edition), Laxmi publications (P) Ltd, New Delhi, 1995
2. White, F.M., "Fluid Mechanics", Tata McGraw-Hill, 5<sup>th</sup> Edition, New Delhi, 2003.
3. Ramamirtham, S., "Fluid Mechanics and Hydraulics and Fluid Machines", Dhanpat Rai and Sons, Delhi, 1998.
4. Som, S.K., and Biswas, G., "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, 2<sup>nd</sup> Edition, 2004.

## 19154C15P FOUNDRY & WELDING TECHNOLOGY

### UNIT-I: INTRODUCTION

9

Introduction to moulding and casting Processes – Steps involved – advantages, limitations and application of casting process. Patterns – Types – their applications – Pattern allowances – Pattern materials – Colour coding as per BIS. Pattern making cores – Core prints – Core boxes – core making.

### UNIT – II: MOULDING PROCESSES

9

Manual moulding processes – equipments and tools – Moulding sand ingredients – Moulding sand properties, influence of ingredients on properties – sand preparation and control – sand testing – machine moulding – types of machines,

### UNIT – III: CASTING PROCESSES

9

Sand casting processes – permanent mould casting processes – pressure die casting, centrifugal casting – precision/investment casting – shell moulding, – continuous casting – electro slag casting processes, Vacuum process, magnetic moulding process.

### UNIT – IV: SPECIAL WELDING PROCESSES

9

Gas tungsten arc (TIG) welding, Gas metal arc (MIG) welding, submerged arc welding, power sources and other characteristics for these individual processes, equipments and accessories, application and limitation of each process. Resistance welding processes – their principle – Types (spot, seam, projection).

### UNIT – V: MODERN WELDING PROCESSES

9

Electron beam welding, laser beam welding, Plasma arc welding, friction welding, explosive welding, ultrasonic welding, stud welding, diffusion bonding, welding of dissimilar metals.

**TUTORIALS: 15**  
**TOTAL HOURS: 60**

### TEXT BOOK

1. Lal, Mand Khanna O.P “A Text Book of Foundry Technology” Dhanpat Rai and Sons, New Delhi 1986.
2. Workshop Technology Volume I & II, Hajra Choudry & Bhattacharya.

### REFERENCES

1. Production Technology, R.K. Jain & S.C. Gupta
2. Radhakrishnan.V.M. “Welding Technology and Design” New age International Pub. Ltd., New Delhi 2002

# 19148C21P NUMERICAL METHODS

## 1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

Linear interpolation methods (method of false position) - Newton's method - Statement of Fixed Point Theorem - Fixed point iteration  $x=g(x)$  method - Solution of linear system of Gaussian elimination and Gauss-Jordan methods - Iterative methods: Gauss Jacobi and Gauss – Seidel methods- Inverse of a matrix by Gauss-Jordan method. Eigen value of a matrix by power methods.

## 2. INTERPOLATION AND APPROXIMATION 9

Lagrangian Polynomials - Divided difference - Interpolation with a cubic spline - Newton forward and backward difference formulae.

## 3. NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Derivatives from difference table - Divided difference and finite difference - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules - Romberg's method - Two and three point Gaussian quadrature formulas - Double integrals using trapezoidal and Simpson's rules.

## 4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step Methods : Taylor Series and methods - 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.

## 5. BOUNDARY VALUE PROBLEMS 9

Finite difference solution for the second order ordinary differential equations. Finite difference solution for one dimensional heat equation by implicit and explicit methods - one dimensional wave equation and two dimensional Laplace and Poisson equations.

**TUTORIAL: 15**

**TOTAL : 60**

### TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi.2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub. Co. Ltd., New Delhi, 1999.

# 19154C22P MACHINE TOOL TECHNOLOGY

## UNIT – I: METAL CUTTING THEORY 8

Introduction: material removal processes, types of machine tools – theory of metal cutting: chip formation, Types of metal cutting, cutting tool materials, Types of tool wear, Simple problems on Tool life.

178

**UNIT –II: CENTRE LATHE AND SPECIAL PURPOSE LATHES 10**

Centre lathe, constructional features, cutting tools, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation.

Capstan and turret lathes – automatic lathes : semi automatic, automats – single spindle : cutting off, multi spindle; cutting off machines.

**UNIT – III: SHAPING, PLANING, SLOTTING & MILLING MACHINES 10**

Reciprocating machine tools: shaper, planer, slotter ; milling : types, milling cutters, operations.

**UNIT – IV: GRINDING, BROACHING AND GEAR CUTTING 10**

Grinding: Introduction- Grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing.

Broaching Machines: broach Specification – push, pull, surface and continuous broaching machines, Gear cutting: forming, generation, shaping, Hobbing.

**UNIT – V: CNC MACHINES AND APT PROGRAMMING 7**

Numerical Control (NC) machine tools – CNC – Introduction, Types, constructional details, special features, Advantages and applications.

Part programming fundamentals – manual programming – computer assisted part programming – APT language.

**TOTAL : 45**

**TEXT BOOKS :**

1. Hajra Choudry, “Elements of Work Shop Technology – Vol. II”, Media Promoters. 2002
2. P.C. Sharma, “A Text Book of Production Engineering”, S. Chand and Co. Ltd, IV edition, 1993.

**REFERENCES:**

1. Rao, P.N. “Manufacturing Technology”, Metal Cutting and Machine Tools, Tata McGraw–Hill, New Delhi, 2003.
2. Richerd R. Kibbe, John E. Neely, Roland O. Merges and Warren J. White, “Machine Tool Practices”, Prentice Hall of India, 2003.
3. HMT – “Production Technology”, Tata McGraw-Hill, 1998.

**19154C23P THERMAL ENGINEERING**

**UNIT-I: GAS POWER CYCLES 9**

Otto, Diesel, Dual, Brayton cycles, Calculation of mean effective pressure and air standard efficiency, Actual and theoretical PV diagram of Four stroke engines, Actual and theoretical PV diagram of two stroke engines.

**UNIT – II: INTERNAL COMBUSTION ENGINES 9**

Classification of IC engine, IC engine components and functions. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol &

diesel engine. Fuels, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control nor

**UNIT – III: STEAM NOZZLES AND TURBINES 9**

Flow of steam through nozzles, shapes of nozzles, effect of friction, critical pressure ratio, supersaturated flow. Impulse and reaction principles, compounding, velocity diagrams for simple and multistage turbines,

**UNIT – IV: AIR COMPRESSORS 9**

Classification and working principle, work of compression with and without clearance. Volumetric efficiency, Isothermal efficiency and isentropic efficiency of reciprocating air compressors. Multistage air compressor and inter cooling – work of multistage air compressor, various types of compressors (Theoretical treatment only).

**UNIT – V: REFRIGERATION AND AIR-CONDITIONING 9**

Vapour compression Refrigeration cycle – super heat, sub cooling, performance calculations. Working principle of vapour absorption system. Ammonia – water, Lithium bromide – water systems (Theory only), Comparison between vapour compression and absorption systems. Psychrometry, Psychrometric chart, Cooling load calculations. Concept of RSHF, GSHF, ESHF, Air conditioning systems.

**TUTORIALS : 15**

**TOTAL HOURS : 60**

(Use of standard thermodynamic tables, Mollier diagram, Psychrometric chart and Refrigerant property tables are permitted in the examination)

**TEXT BOOKS**

1. Rajput, “Thermal Engineering”, S. Chand publishers, 2000.

**REFERENCES**

1. Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., “A course in Thermal Engineering”, Dhanpat Rai & Sons, Fifth edition, 2002
2. Holman. J.P., “Thermodynamics”, McGraw-Hill, 1985.
3. Rogers, Meyhew, “Engineering Thermodynamics”, ELBS, 1992.
4. Arora.C.P., “Refrigeration and Air conditioning”, TMH, 1994.  
Sarkar B.K, “ Thermal Engineering”, Tata McGraw-Hill, 1998.



## 19154C24P STRENGTH OF MATERIALS

### 1. STRESS AND STRAIN

9

Bodies - Rigid and Deformable bodies- Stresses; Tensile, Compressive and Shear – Deformation of simple and compound bars under axial load – Thermal stress – Elastic constants – Strain energy and unit strain energy

### 2. BEAMS - SFD & BMD

9

Beams -Types: Supports and Loads – Shear force and Bending Moment Diagrams in beams – Cantilever and Simply supported– Stresses in beams – Theory of simple bending – Stress variation along the length and in the beam section – Effect of shape of beam section on stress induced.

### 3. TORSION IN SHAFTS

9

Analysis of torsion in shafts – Shear stress distribution – Solid, Stepped and Hollow shafts – Twist and torsion stiffness – Replacement of Shafts - Compound shafts – Fixed and simply supported shafts.

### 4. DEFLECTION IN SPRINGS

9

Springs- Introduction, Types- Close coiled helical springs – Maximum shear stress in spring section– Deflection of helical coil springs under axial loads – Design of helical coil springs – stresses in helical coil springs under torsion loads

### 5. ANALYSIS OF STRESSES IN TWO DIMENSIONS

9 181

Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point –Principal planes and stresses – Analytical Method- Graphical Method: Mohr's circle – Only for two stresses applied mutually perpendicular to each other on a body– Maximum shear stress.

**TUTORIALS 15**  
**TOTAL: 60**

### TEXT BOOKS

1. Popov E.P, "Engineering Mechanics of Solids", Prentice-Hall of India, New Delhi, 1997.
2. Kazimi S.M.A, "Solid Mechanics", Tata McGraw-Hill Publishing Co, New Delhi, 1981

### REFERENCE BOOKS

1. Nash W.A, "Theory and problems in Strength of Materials", Schaum Outline Series, McGraw-Hill Book Co, New York, 1995
2. Ryder G.H, "Strength of Materials", Macmillan India Ltd., Third Edition, 2002
3. Singh D.K "Mechanics of Solids" Pearson Education 2002.

## 19154C25P ENGINEERING MATERIALS AND METALLURGY

### 1. CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 10

Solid solutions, substitutional and interstitial – phase diagrams, invariant reactions, Iron – Iron carbide equilibrium diagram

### 2. HEAT TREATMENT 11

Definition – Full annealing, stress relief, recrystallisation and spheroidizing –normalising, hardening and Tempering of steel. Isothermal transformation diagrams – cooling curves superimposed on I.T. diagram CCR - Hardenability, Jominy end quench test

### 3. FERROUS AND NON FERROUS METALS 9

Effect of alloying additions on steel (Mn, Si, Cr, Mo, V Ti & W) - stainless and tool steels – HSLA - maraging steels –types of Cl  
Copper and Copper alloys – Brass, Bronze and Cupronickel – Aluminum and Al-Cu – precipitation strengthening treatment.

### 4. NON-METALLIC MATERIALS 9

Polymers – types of polymer– Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers — Engineering Ceramics – Properties and applications of  $Al_2O_3$ , SiC, SiC,  $Si_3N_4$ , PSZ and Sialon – Fibre and particulate reinforced composites.

### 5. MECHANICAL PROPERTIES AND TESTING 6

Mechanism of plastic deformation, slip and twinning – Types of fracture – Testing of materials under tension, compression and shear loads – Hardness tests (Brinell, Vickers and Rockwell) Impact test Izod and charpy, fatigue and creep test.

**Total Hours : 45**

### TEXT BOOK:

1. Kenneth G.Budinski and Michael K.Budinski "Engineering Materials" Prentice-Hall of India Private Limited, 4<sup>th</sup> Indian Reprint 2002. 182

**REFERENCES:**

- 1. William D Callsber “Material Science and Engineering”, John Wiley and Sons 1997.
- 2. Raghavan.V “Materials Science and Engineering”, Prentice Hall of India Pvt., Ltd., 1999.  
Sydney H.Avner “Introduction to Physical Metallurgy” McGraw Hill Book Company, 1994

**19148C31CP PROBABILITY AND STATISTICS**

**1. PROBABILITY AND RANDOM VARIABLE 9**

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.

**2. TWO DIMENSIONAL RANDOM VARIABLES 9**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

**3. STANDARD DISTRIBUTIONS 9**

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable.

**4. TESTING OF HYPOTHESIS 9**

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.

**5. DESIGN OF EXPERIMENTS 9**

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.  
*Note : Use of approved statistical table permitted in the examination.*

**TUTORIALS 15**

**TOTAL : 60**

**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**

- 1. Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, “Probability and Statistics for Engineers and Scie 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.

# 19154C32P KINEMATICS OF MACHINERY

## UNIT – I: BASICS OF MECHANISMS

7

Terminology and Definitions-Degree of Freedom Mobility-Kutzbach criterion-Grashoff's law-Kinematic Inversions of 4-bar chain and slider crank chains-Mechanical Advantage-Transmission angle-Description of reciprocating Mechanisms-Single slider crank, double slider crank mechanisms, Quick return mechanisms, Offset slider crank mechanism.

## UNIT – II: KINEMATICS

12

Displacement, velocity and acceleration - analysis in simple mechanisms - Graphical Method velocity and acceleration polygons -Vector Approach, - Coriolis Acceleration.

## UNIT – III: CAM PROFILE

8

Introduction-Classification cam and followers- cam nomenclature- Displacement diagrams-uniform velocity motion, uniform acceleration and retardation motion -Simple harmonic and Cycloidal motions – construction of displacement, velocity and acceleration diagrams- construction of cam profile with knife edge follower, roller follower, oscillating follower, flat faced mushroom follower

## UNIT – IV: GEARS

10

Spur gear Terminology and definitions-Fundamental Law of toothed gearing-Inter changeable gears-gear tooth action – Terminology - Interference and undercutting-Non standard gear teeth- Helical, Bevel, Worm, Rack and Pinion gears (Basics only)-Gear trains-Parallel axis gear trains- Epicyclic gear trains

## UNIT – V: FRICTION

8

Friction-Concepts, Types - Friction drives: Clutches - Introduction, Single & Multiplate Clutches – Friction in screw threads - Belt and rope drives.

Brakes: Types – Block Brake, Band: Simple Band & Differential, Band and Block Brakes.

TUTOR

IALS

15

**TOTAL HOURS : 60**

### TEXT BOOKS

1. Rattan S.S, "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.
2. Ghosh A and A.K.Mallick, "Theory of Mechanisms and Machines", Affiliated East-West Pvt. Ltd., New Delhi, 1988.

### REFERENCES:

1. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.
2. Rao J.S and Dukkipati R.V, "Mechanism and Machine Theory", Wiley-Eastern Ltd., New Delhi, 1992.
3. John Hannah and Stephens R.C, "Mechanics of Machines", Viva Low-Prices Student Edition, 1999

### STANDARDS:

1. IS 2458 : 2001, Vocabulary of Gear Terms – Definitions Related to Geometry
2. IS 3756 : 2002, Method of Gear correction – Addendum modification for External Cylindrical Gears with Parallel Axes.
3. IS 5267 : 2002 Vocabulary of Gear Terms – Definitions Related to Worm Gear Geometry.
4. IS 12328 : Part 1: 1988 Bevel Gear Systems Part – 1 Straight Bevel Gears.

5. IS 12328 : Part 2: 1988 Bevel Gear Systems Part – 2 Spiral Bevel Gears.

## **19154C38P PRODUCTION PLANNING AND CONTROL**

### **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

### **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.

## **19154C34P ENGINEERING METROLOGY AND MEASUREMENTS**

### **UNIT – I: INTRODUCTION 9**

Measurement -Introduction – Generalised measurement system-Units and standards-measuring instruments- range of accuracy, precision- repeatability-systematic and random errors-correction, calibration, interchangeability.

### **UNIT – II: LINEAR AND ANGULAR MEASURING DEVICES 9**

Definition of Metrology-Linear measuring instruments: Vernier, micrometer, interval measurement, Slip gauges and classification, limit gauges- Comparators: Mechanical, pneumatic and electrical types, applications.

Angular measurements: -Sine bar, optical bevel protractor, angle Decker – Taper measurements.

**UNIT – III: SCREW THREAD & GEAR FORM MEASUREMENT 9** Measurement of screw threads-Thread gauges, floating carriage micrometer-measurement of gears-tooth thickness-constant chord and base tangent method-.

### **UNIT – IV: LASER METROLOGY AND CMM 9**

Precision instruments based on laser-Principles- laser interferometer-application in linear, angular measurements

Coordinate measuring machine (CMM)- Constructional features – types, applications –computer aided

inspection.

## UNIT – V: POWER, FLOW AND TEMPERATURE MEASUREMENT 9

Force, torque, power:-mechanical and pneumatic type-Flow measurement: Venturi, orifice, rotameter,–  
Temperature: bimetallic strip, pressure thermometers, thermocouples,

### TEXT BOOKS:

1. Jain R.K., “Engineering Metrology”, Khanna Publishers, 1994
2. Alan S. Morris, “The Essence of Measurement”, Prentice Hall of India, 1997

### REFERENCES:

1. Gupta S.C, “Engineering Metrology”, Dhanpat rai Publications, 1984
2. Jayal A.K, “Instrumentation and Mechanical Measurements”, Galgotia Publications 2000
3. Alan S. Morris, “The Essence of Measurement”, Prentice Hall of India, 1997
4. Donald D Eckman, “Industrial Instrumentation”, Wiley Eastern, 1985.

## 19154L35P COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY

### LIST OF EXPERIMENTS

#### A. Simulation

- |  |    |
|--|----|
| 1. Simulation of cam and follower mechanism using C / MAT Lab.                 | 15 |
| 2. Analysis (Simple Treatment only)  | 30 |
| 3. Stress analysis of a plate with a circular hole.                            |    |
| 4. Stress analysis of rectangular L bracket                                    |    |
| 5. Stress analysis of an axi-symmetric component                               |    |
| 6. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)         |    |
| 7. Mode frequency analysis of a 2 D component                                  |    |
| 8. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends) |    |
| 9. Harmonic analysis of a 2D component   |    |
| 10. Thermal stress analysis of a 2D component                                  |    |
| 11. Conductive heat transfer analysis of a 2D component                        |    |
| 12. Convective heat transfer analysis of a 2D component                        |    |

**TOTAL : 45**



# 19154C41P POWER PLANT ENGINEERING

## UNIT – I: INTRODUCTION

:

9

Layout of Steam, Hydel, Diesel, MHD, Nuclear and Gas Turbine Power Plants - Steam Boilers and Cycles – High Pressure and Super Critical Boilers – Fluidised Bed Boilers

## UNIT – II: STEAM POWER PLANT

9

Fuel Handling and Ash Handling, Combustion Equipment for burning coal, Mechanical Stokers, Pulveriser, Electrostatic Precipitator, Draught, Cooling Towers

## UNIT – III: NUCLEAR AND HYDEL POWER PLANTS

9

Nuclear Energy – Fission, Fusion Reaction, Types of Reactors, pressurized water reactor, Boiling Water Reactor, .

Hydel Power Plant – Essential Elements, Selection of Turbines, Governing of Turbines- Micro Hydel developments.

## UNIT – IV: DIESEL AND GAS TURBINE POWER PLANT

9

Types of Diesel Plants, Components, Selection of Engine Type, Applications Gas Turbine Power Plant – Fuels – Open and Closed Cycles – Reheating – Regeneration and Intercooling

## UNIT – V: POWER PLANTS ECONOMICS

9

Geo thermal – OTEC – Tidel - Pumped storage - Solar thermal central receiver system.

Cost of Electric Energy – Fixed and operating Costs – Energy Rates – Economics of load sharing, comparison of economics of various power plants.

**Total Hours: 45**

### TEXT BOOKS:

1. G.D.Rai, "Introduction to Power Plant Technology", Khanna Publishers, 1995.
2. Nag P.K, "Power plant Engineering", Tata McGraw-Hill, 1998.

### REFERENCES:

1. K.K.Ramalingam, "Power Plant Engineering", Scitech Publications, 2002.

2. Frank D.Graham "Power Plant Engineers Guide", D.B. Taraporevala Sons & Co, New Delhi, 1993.
3. T.Morse Frederick, "Power Plant Engineering", Prentice Hall of India, 1998

## 19154C42P DYNAMICS OF MACHINERY

### UNIT – I: FORCE ANALYSIS IN MOVING PARTS 10

Rigid Body dynamics in general plane motion – Equations of motion - Dynamic force analysis - Inertia force and Inertia torque – D'Alemberts principle - - Dynamic Analysis in Reciprocating Engines – Gas Forces - Equivalent masses - Bearing loads - Crank shaft Torque - Turning moment diagrams - Fly wheels

### UNIT – II: BALANCING OF MOVING PARTS 9

Static and dynamic balancing - Balancing of rotating masses – Balancing-single cylinder Multi-cylinder - Partial balancing in locomotive Engines - Balancing linkages - balancing machines

### UNIT – III: FREE VIBRATIONS 10

Basic features of vibratory systems - idealized models - Basic elements and lumping of parameters - Degrees of freedom - Single degree of freedom - Free vibration - Equations of motion - natural frequency - Types of Damping - Damped vibration critical speeds of simple shaft - Torsional systems

### UNIT – IV: FORCED VIBRATIONS 6

Response to periodic forcing - Harmonic Forcing - Forcing caused by unbalance - Support motion – Force transmissibility and amplitude transmissibility – Vibration isolation.

### UNIT – V: MECHANISMS FOR CONTROL 10

Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors –Characteristics - Effect of friction - Controlling Force -

Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes

### TUTORIAL 15

**TOTAL HOURS : 60**

### TEXT BOOKS:

1. Rattan S.S., "Theory of Machines", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1994.
2. Thomas Bevan, "Theory of Machines", CBS Publishers and Distributors, 1984.

### REFERENCES:

- 1 Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
- 2 Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995.
3. Rao J.S. and Dukkupati R.V., "Mechanism and Machine Theory ", Wiley-Eastern Limited, New Delhi, 1992.

## 19154C43P DESIGN OF MACHINE ELEMENTS

### UNIT – I: STRESSES IN MACHINE MEMBERS 9

Introduction to the design process - factor influencing machine design, selection of materials based on mechanical properties – Direct, Bending and torsional stress equations – Impact and shock loading – calculation of principle stresses for various load combinations, Factor of safety - theories of failure – stress concentration – design for variable loading – Soderberg, Goodman and Gerber relations

**UNIT – II: DESIGN OF SHAFTS AND COUPLINGS 9**

Design of solid and hollow shafts based on strength, rigidity and critical speed – Design of keys and key ways - Design of rigid and flexible couplings – Introduction to gear and shock absorbing couplings

**UNIT – III: DESIGN OF FASTNERS AND WELDED JOINTS 9**

Threaded fastners - Design of bolted joints including eccentric loading – Design of welded joints for pressure vessels and structures -.

**UNIT – IV: DESIGN OF  
SPRINGS AND LEVERS**

9

Design of helical, leaf, disc and torsional springs under constant loads and varying loads – Concentric torsion springs - Belleville springs

**UNIT – V: DESIGN OF  
BEARINGS AND  
FLYWHEELS**

9

Design of bearings – sliding contact and rolling contact types. – Cubic mean load – Design of journal bearings – Mckees equation – Lubrication in journal bearings – calculation of bearing dimensions

**TUTORIAL 15**

**TOTAL HOURS : 60**

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

**TEXT BOOKS:**

1. Juvinall R.C, and Marshek K.M, “Fundamentals of Machine Component Design”, John Wiley & Sons, Third Edition, 2002.
2. Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2003.

**REFERENCES:**

1. Norton R.L, “Design of Machinery”, Tata McGraw-Hill Book Co, 2004.
2. Orthwein W, “Machine Component Design”, Jaico Publishing Co, 2003.
3. Ugural A.C, “Mechanical Design – An Integral Approach, McGraw-Hill Book Co, 2004.
4. Spotts M.F., Shoup T.E “Design and Machine Elements” Pearson Education, 2004.

**STANDARDS:**

IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 1 : Construction.

IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 2 : Friction and Wear.

IS 10260 : Part 1 : 1982 Terms, definitions and classification of Plain bearings Part 3 : Lubrication.

**19154L45P DYNAMICS LABORATORY**

## LIST OF EXPERIMENTS

1. Governors - Determination of sensitivity, effort, etc. for Watt, Porter
2. Cam - Study of jump phenomenon and drawing profile of the cam.
3. Motorised Gyroscope-Verification of laws -Determination of gyroscopic couple.
4. Whirling of shaft-Determination of critical speed of shaft with concentrated loads.
5. Balancing of rotating masses.
6. Determination of moment of inertia by oscillation method for connecting rod and flywheel.
7. Vibrating system - Spring mass system-Determination of damping co-efficient of single degree of freedom system.
8. Determination of torsional frequencies for compound pendulum and flywheel system with lumped Moment of inertia.
9. Transverse vibration –free- Beam. Determination of natural frequency and deflection of beam.

**Total Hours: 45**

### **19154C51P HEAT AND MASS TRANSFER**

#### **UNIT – I: CONDUCTION**

11

Basic Concepts – Mechanism of Heat Transfer – Conduction, Convection and Radiation – General Differential equation of Heat Conduction – Fourier Law of Conduction – Cartesian and Cylindrical Coordinates – One Dimensional Steady State Heat Conduction – Conduction through Plane Wall, Composite walls– Conduction with Internal Heat Generation –

#### **UNIT – II: CONVECTION**

10

Basic Concepts – Convective Heat Transfer Coefficients – Boundary Layer Concept – Types of Convection – Forced Convection – Dimensional Analysis – External Flow – Flow over Plates,– Internal Flow – Laminar and Turbulent Flow – Free Convection –Flow over Vertical Plate, Horizontal Plate, Inclined Plate

#### **UNIT – III: HEAT EXCHANGERS**

9

Nusselts theory of condensation-pool boiling, flow boiling, correlations in boiling and condensation. Types of Heat Exchangers – LMTD Method of heat Exchanger Analysis – Effectiveness – NTU method of Heat Exchanger Analysis – Overall Heat Transfer Coefficient – Fouling Factors.

#### **UNIT – IV: RADIATION**

8

Basic Concepts, Laws of Radiation – Stefan Boltzman Law, Kirchoff Law –Black Body Radiation –Grey body radiation Shape Factor Algebra – Radiation Shields .

UNIT – V: MASS TRANSFER

7

Basic Concepts – Diffusion Mass Transfer – Fick’s Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy

TUTORIAL:15

TOTAL HOURS : 60

Note: (Use of standard heat and mass transfer data book is permitted in the University examination)

TEXT BOOKS:

1. Sachdeva R C, “Fundamentals of Engineering Heat and Mass Transfer” New Age International, 1995.
2. Kothandaraman C.P “Fundamentals of Heat and Mass Transfer” New Age International, New Delhi, 1998

19154C52P DESIGN OF TRANSMISSION SYSTEMS

UNIT – I: DESIGN OF TRANSMISSION SYSTEMS 9

Selection of V belts and pulleys – selection of Flat belts and pulleys – Selection of Transmission chains and Sprockets. Design of pulleys and sprockets.

UNIT – II: SPUR GEARS AND PARALLEL AXIS HELICAL GEARS 9

Gear Terminology-Speed ratios and number of teeth-Force analysis - Dynamic effects - Fatigue strength - Factor of safety - Gear materials – Module and Face width-power rating calculations based on strength and wear considerations – Pressure angle in the normal and transverse plane- Equivalent number of teeth-forces and stresses.

UNIT – III: BEVEL AND CROSS HELICAL GEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.

Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT – IV: GEAR BOXES DESIGN 9

Geometric progression - Standard step ratio - Ray diagram, kinematics layout -Design of sliding mesh gear box -Constant mesh gear box. – Design of multi speed gear box.

UNIT – V: DESIGN OF CAM, CLUTCHES AND BRAKES 9

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-

**TUTORIALS 30**  
**TOTAL HOURS: 75**

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

**TEXT BOOKS**

1. Prabhu. T.J., “Design of Transmission Elements”, Mani Offset, Chennai, 2000,
2. Bhandari, V.B., “Design of Machine Elements”, Tata McGraw-Hill Publishing Company Ltd., 1994.

**REFERENCES**

1. Maitra G.M., Prasad L.V., “Hand book of Mechanical Design”, II Edition, Tata McGraw-Hill, 1985.
2. Shigley J.E and Mischke C. R., “Mechanical Engineering Design”, McGraw-Hill International Editions, 1989.

**19154C53P AUTOMOBILE ENGINEERING**

**UNIT – I: STRUCTURE OF VEHICLES AND ENGINES**

**10**

Types of Automobiles - Vehicle Construction – Chassis – Frame and Body –aerodynamics. Components of Engine – Their forms, Functions and Materials - Review of Cooling and Lubrication systems in Engine – Turbo Chargers –.

**UNIT – II: ENGINE AUXILIARY SYSTEMS**

**10**

Carburetor–working principle- Electronic fuel injection system – Mono-point and Multi - Point Injection Systems – Construction, Operation and Maintenance of Lead Acid Battery - Electrical systems – Battery generator – Starting Motor and Drives – Lighting and Ignition (Battery, Magneto Coil and Electronic Type)-Regulators-cut outs.

**UNIT – III: TRANSMISSION SYSTEMS**

**10**

Clutch – Types and Construction – Gear Boxes, Manual and Automatic – Simple Floor Mounted Shift Mechanism – Over Drives – Transfer Box Fluid flywheel-Torque convertors– Propeller shaft – Slip Joint – Universal Joints – Differential and Rear Axle.

**UNIT – IV: STEERING, BRAKES AND SUSPENSION**

**10**

Wheels and Tyres – Wheel Alignment Parameters - Steering Geometry and Types of steering gear box– Power Steering – Types of Front Axle – Suspension systems – Braking Systems – Types and Construction.

**UNIT – V: ALTERNATIVE ENERGY SOURCES**

**5**

Use of Natural Gas, LPG, Biodiesel, Gasohol and Hydrogen in Automobiles - Electric and Hybrid Vehicles, Fuel Cells.

Note: Practical training in dismantling and assembling of Engine parts Transmission System should be given to the students

Total Hours : 45

**TEXT BOOKS:**

1. Sethi H.M, “Automobile Technology”, Tata McGraw-Hill-2003
2. Kirpal Singh “Automobile Engineering Vol. 1& 2”, Standard Publishers, New Delhi.

**REFERENCES:**

194

1. Crouse and Anglin "Automotive Mechanism", 9<sup>th</sup> Edition. Tata McGraw-Hill, 2003.
2. Newton, Steeds and Garet, "Motor vehicles", Butterworth Publishers, 1989.
3. Srinivasan.S , " Automotive Mechanics" 2<sup>nd</sup> edition, 2003, Tata McGraw-Hill.

**19154L55P THERMAL  
ENGINEERING  
LABORATORY II**

LIST OF EXPERIMENTS

**HEAT TRANSFER**

**30**

1. Thermal conductivity measurement by guarded plate method
2. Thermal conductivity of pipe insulation using lagged pipe apparatus
3. Natural convection heat transfer from a vertical cylinder
4. Forced convection Inside tube
5. Heat transfer from Pin-fin (natural & forced convection modes)
6. Determination of Stefan-Boltzmann constant
7. Determination of Emissivity of a grey surface
8. Effectiveness of Parallel/counter flow heat exchanger

**REFRIGERATION AND AIR CONDITIONING**

**15**

1. Determination of COP of a refrigeration system
2. Experiments on air-conditioning system
3. Performance test on single/two stage reciprocating air compressor.

**Total Hours : 45**

**UNIT – I: INTRODUCTION TO FEA: 9**

Historical background – Matrix approach – Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method

**UNIT – II: ONE DIMENSIONAL PROBLEMS 9**

Finite element modeling – Coordinates and shape functions- Potential energy approach – Galarkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses

**UNIT – III: TWO DIMENSIONAL PROBLEMS 9**

Introduction – Finite element modelling – Scalar valued problem – Poisson equation –Laplace equation – Triangular elements – Element stiffness matrix – Force vector – Galarkin approach - Stress calculation.

**UNIT – IV: AXISYMMETRIC PROBLEMS 9**

Axisymmetric formulation – Element stiffness matrix and force vector – Galarkin approach – Body forces– Stress calculations – Boundary conditions.

**UNIT – V: ISOPARAMETRIC ELEMENTS 9**

The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration - Stiffness integration – Stress calculations – Four node quadrilateral for axisymmetric problems.

**TUTORIAL 15**

**TOTAL HOURS :60**

**TEXT BOOKS:**

1. Chandrupatla T.R., and Belegundu A.D., “Introduction to Finite Elements in Engineering”, Pearson Education 2002, 3<sup>rd</sup> Edition.
2. Reddy J.N., “An Introduction to Finite Element Method”, McGraw-Hill International Student Edition, 1985

**19154C62P MECHATRONICS**

**UNIT – I: INTRODUCTION 9**

Introduction to Mechatronics – Measurement Systems – Control Systems – Microprocessor based Controllers.

Sensors and Transducers – Performance Terminology – Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors



- Selection of Sensors

**UNIT – II: POWER DRIVE SYSTEM 9**

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators.  
Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings.

Electrical Actuation Systems – Mechanical Switches – Solid State Switches – Solenoids – D.C Motors – A.C Motors – Stepper Motors.

**UNIT – III: SYSTEM MODELS AND CONTROLLERS 9**

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational – Transnational Systems, Electromechanical Systems – Hydraulic – Mechanical Systems.

Continuous and discrete process Controllers – Control Mode – Two – Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers.

**UNIT – IV: PROGRAMMING LOGIC CONTROLLERS(PLC) 9**

Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming – Mnemonics – Timers, Internal relays and counters – Shift Registers – Master and Jump Controls – Data Handling – Analogs Input / Output .

**UNIT – V: DESIGN OF MECHATRONICS SYSTEM 9**

Stages in designing Mechatronics Systems – Traditional and Mechatronic Design - Possible Design Solutions

Case Studies of Mechatronics Systems, Pick and place robot – Automatic Car Park Systems

**Total Hours : 45**

**TEXT BOOKS:**

1. W. Bolton, “Mechatronics”, Pearson Education, Second Edition, 1999.

**REFERENCES**

1. Michael B. Hstand and David G. Alciatore, “ Introduction to Mechatronics and Measurement Systems”, McGraw-Hill International Editions, 2000.
2. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
3. Dan Neculesu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).

**19154C63P COMPUTER INTEGRATED MANUFACTURING**

**UNIT – I: INTRODUCTION 8**

CIM-Introduction. - External communication - islands of automation and software-dedicated and open systems-manufacturing automation protocol - product related activities of a company- marketing engineering - production planning - plant operations - physical distribution.

**UNIT – II: GROUP TECHNOLOGY AND CAPP 10**

History of group technology- role of G.T. in CAD/CAM integration - part families - classification and coding - DCLASS and MICLASS and OPITZ coding systems-facility design using G.T. -benefits of G.T. - cellular manufacturing.

approaches to computer aided process planning -variant approach and generative approaches - CAPP and CMPP process planning systems.

**UNIT – III: SHOP FLOOR CONTROL AND BASICS OF FMS 9**

Shop floor control -factory data collection system -automatic identification methods- Bar code technology-automated data collection system.

FMS-components of FMS - types -FMS workstation -material handling and storage systems- FMS layout

**UNIT – IV: CIM IMPLEMENTATION AND LAN 10**

CIM and company strategy - system modeling tools - IDEF models - activity cycle diagram - CIM open system architecture (CIMOSA)- manufacturing enterprise wheel-CIM architecture.

Communication fundamentals- local area networks -topology - LAN implementations - network management and installations.

**UNIT – V: OPEN SYSTEM AND DATABASE FOR CIM 8**

Open systems-open system inter connection - manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases -database terminology- architecture of database systems-data modeling and data associations -relational data bases - database operators - advantages of data base and relational database.

Total Hours : 45

**TEXT BOOKS:**

1. Mikell.P.Groover “Automation, Production Systems and computer integrated manufacturing”, Pearson Education 2001.
2. Radhakrishnan P, Subramanyan S.and Raju V., “CAD/CAM/CIM”, 2<sup>nd</sup> Edition New Age International (P) Ltd, New Delhi. 2000.

**REFERENCES:**

1. Roger Hanman “Computer Intergrated Manufacturing”, Addison –Wesley, 1997.
2. Mikell.P.Groover and Emory Zimmers Jr., “CAD/CAM”, Prentice hall of India Pvt. Ltd., New Delhi- 1.1998.

**19154L65P MECHATRONICS LABORATORY**

**LIST OF EXPERIMENTS**

1. Fluid power circuits to control
  - (i) single and double acting cylinder
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
4. Servo controller interfacing for open loop
5. Servo controller interfacing for closed loop
6. Stepper motor interfacing with 8051 Micro controller
  - (i) full step resolution (ii) half step resolution
7. Computerized data logging system with control for process variables like pressure flow and temperature.

**TOTAL : 45**

**19160C71P TOTAL  
QUALITY MANAGEMENT**

**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**

**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

# 19154C72P PROCESS PLANNING AND COST ESTIMATION

## UNIT-I: WORK STUDY

### AND TIME STUDY

10

Method study – Definition – Objectives-Motion economy- Principles – Tools and Techniques-Applications – Work measurements- purpose – use – procedure – tools and techniques- Standard time –Time study– principles – applications.

## UNIT-II: PROCESS PLANNING

10

Definition – Objective –approaches to process planning- Process planning activities – Finished part requirements- manufacturing sequences- machine selection – material selection parameters- Set of documents for process planning-process chart - production time calculation – selection of cost optimal processes.

## UNIT-III: INTRODUCTION TO COST ESTIMATION

7

Objective of cost estimation- costing – cost accounting- classification of cost- Elements of cost.

## UNIT-IV: COST

### ESTIMATION

8

Types of estimates – methods of estimates – data requirements and sources- collection of cost

## UNIT-V: PRODUCTION

### COST ESTIMATION

10

Estimation of material cost, labour cost and over heads, allocation of overheads – Estimation for different types of jobs. Total Hours : 45

## TEXT BOOKS:

- 1 Sinha.B.P., "Mechanical Estimating and Costing", Tata McGraw-Hill, Publishing Co., 1995
- 2 Russell.R.S and Tailor, B.W, "Operations Management", PHI, 4<sup>th</sup> Edition, 2003.

## REFERENCES:

1. Phillip.F Ostwalal and Jairo Munez, "Manufacturing Processes and systems", John Wiley, 9<sup>th</sup> Edition, 1998.
2. Chitale.A.V. and Gupta.R.C., "Product Design and Manufacturing", PHI, 2<sup>nd</sup> Edition, 2002.

# 19154C73P APPLIED HYDRAULICS AND PNEUMATICS

201

**UNIT – I: FUNDAMENTALS OF FLUID POWER SYSTEM 9**

Fluid power, Advantages Application .Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols.  
Basics of Hydraulics- Pascals Law- Laminar and Turbulent flow – Reynold’s number

**UNIT – II: HYDRAULIC SYSTEM & COMPONENTS**

9

Sources of Hydraulic Power: Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump characteristics – Variable displacement pumps.  
Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

**UNIT – III: DESIGN OF HYDRAULIC CIRCUITS**

9

Construction of Control Components : Director control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve –Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram.  
Accumulators and Intensifiers : Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

**UNIT – IV: PNEUMATIC SYSTEMS AND COMPONENTS 9**

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators.  
Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, , Sequential circuit design for simple applications using cascade method.

**UNIT – V: DESIGN OF PNEUMATIC CIRCUITS 9**

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves.  
Fluidics – Introduction to fluidic devices, simple circuits,. Fluid power circuits; failure and troubleshooting.

**Total Hours : 45**

**TEXT BOOKS :**

- 1. Anthony Esposito, “Fluid Power with Applications”, Pearson Education 2000.
- 2. Dudelyt, A. Pease and John T. Pippenger, “Basic Fluid Power”, Prentice Hall, 1987.

**REFERENCES:**

- 1. Anthony Lal, “Oil hydraulics in the service of industry”, Allied publishers, 1982.
- 2. Michael J, Prinches and Ashby J. G, “Power Hydraulics”, Prentice Hall, 1989.
- 3. Majumdar S.R., “Oil Hydraulics”, Tata McGraw-Hill, 2000.

**LIST OF ELECTIVES**

**19154E44AP GAS DYNAMICS AND JET PROPULSION**

**UNIT – I: FUNDAMENTALS OF COMPRESSIBLE FLOW 8**

Energy and momentum equations for compressible fluid flows, various regions of flows, reference velocities, stagnation state, velocity of sound, critical states, Mach number, critical Mach number, Mach cone, Mach angle, effect of Mach number on compressibility.

**UNIT – II: FLOW THROUGH VARIABLE AREA DUCTS 9**

Isentropic flow through variable area ducts, T-s, h-s diagrams for nozzle and diffuser flows, area ratio

as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.

**UNIT – III : Flow through Constant Area Ducts 10**

Flow in constant area ducts with friction (Fanno flow) – Fanno curves and Fanno flow equation, variation of flow properties  
Flow in constant area ducts with heat transfer (Rayleigh flow), Rayleigh line and Rayleigh flow equation, variation of flow properties,

**UNIT – IV: NORMAL SHOCK 8**

Governing equations, variation of flow parameters like static pressure, static temperature, density, stagnation pressure and entropy across the normal shock, Prandtl - Meyer equation, flow in convergent and divergent nozzle with shock, normal shock in Fanno and Rayleigh flows,

**UNIT – V: PROPULSION 10**

Aircraft propulsion – types of jet engines – energy flow through jet engines, study of turbojet engine components – diffuser, compressor, combustion chamber, turbine and exhaust systems, performance of turbo jet engines – thrust, thrust power, propulsive and overall efficiencies, ram jet and pulse jet engines

**TUTORIAL 15**

**TOTAL HOURS : 60**

Note: (Use of approved gas tables is permitted in the University examination)

**TEXT BOOKS**

1. Yahya. S.M., “Fundamental of compressible flow”, New Age International (p) Ltd., New Delhi, 1996.
2. Patrich.H. Oosthvizen, William E.Carscallen, “Compressible fluid flow”, McGraw-Hill, 1997

**REFERENCES:**

1. Cohen. H., Rogers R.E.C and Sravanamutoo, “Gas turbine theory”, Addison Wesley Ltd., 1987.
2. Ganesan. V., “Gas Turbines”, Tata McGraw-Hill, New Delhi, 1999
3. Rathakrishnan.E, “Gas Dynamics”, Prentice Hall of India, New Delhi, 2001

**19154E44BP REFRIGERATION AND AIR CONDITIONING**

**UNIT – I: REFRIGERATION CYCLES 9**

Review of thermodynamic principles of refrigeration. Vapour compression refrigeration cycle - use of P-H charts - multistage systems - cascade system - COP comparison. Vapor absorption refrigeration system. Ammonia water and Lithium Bromide water systems.

**UNIT – II: REFRIGERANTS AND SYSTEM COMPONENTS 9**

Compressors - reciprocating & rotary (Fundamentals only) - condensers - evaporators - cooling towers. Refrigerants - properties - selection of refrigerants, Alternate Refrigerants, Refrigeration plant controls - testing and charging of refrigeration units. Applications to refrigeration systems - ice plant - food storage plants.

**UNIT – III: PSYCHROMETRY 9**

Psychrometric processes- use of psychrometric charts - Grand and Room Sensible Heat Factors - bypass factor - requirements of comfort air conditioning - comfort charts - factors governing optimum effective temperature,

**UNIT – IV: COOLING**

**LOAD CALCULATIONS**

**9**

Types of load - design of space cooling load - heat transmission through building. Solar radiation - infiltration - internal heat sources (sensible and latent) - outside air and fresh air load - estimation of total load - Domestic, commercial and industrial systems - central air conditioning systems.

#### **UNIT – V: AIRCONDITIONING SYSTEM**

**9**

Air conditioning equipments – air cleaning and air filters - humidifiers - dehumidifiers - air washers - condenser – cooling tower and spray ponds - elementary treatment of duct design - air distribution system. Thermal insulation of air conditioning systems. - applications: car, industry, stores, and public buildings

**Total Hours : 45**

#### **TEXT BOOKS:**

1. Manohar Prasad, "Refrigeration and Air Conditioning", Wiley Eastern Ltd., 1983.
2. Arora. C.P., "Refrigeration and Air Conditioning", Tata McGraw-Hill New Delhi, 1988.

#### **REFERENCES:**

1. Jordon and Prister, "Refrigeration and Air Conditioning", Prentice Hall of India PVT Ltd., New Delhi, 1985.
2. Stoecker N.F and Jones,"Refrigeration and Air Conditioning"TMH, New Delhi,

## **19154E44CP NON DESTRUCTIVE TESTING**

#### **UNIT I: OVERVIEW OF NDT**

**9**

NDT Versus Mechanical testing, Overview of the Non Destructive Testing Methods for the detection of manufacturing defects as well as material characterisation. Relative merits and limitations, Various physical characteristics of materials and their applications in NDT., Visual inspection – Unaided and aided.

#### **UNIT II: SURFACE NDE METHODS**

**9**

Liquid Penetrant Testing - Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods, Testing Procedure, Interpretation of results. Magnetic Particle Testing- Theory of magnetism, inspection materials Magnetisation methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.

#### **UNIT III:THERMOGRAPHY AND EDDY CURRENT TESTING (ET)**

**9**

Thermography- Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation - infrared radiation and infrared detectors, Instrumentations and methods, applications. Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

#### **UNIT IV: ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE)**

**9**

Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A-scan, B-scan, C-scan. Phased Array Ultrasound,



Time of Flight Diffraction. Acoustic Emission Technique – Principle, AE parameters, Applications.

## **UNIT V: RADIOGRAPHY (RT)**

**9**

Principle, interaction of X-Ray with matter, imaging, film and film less techniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films - graininess, density, speed, contrast, characteristic curves, Penetrimeters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TOTAL : 45 PERIODS

### **TEXT BOOKS:**

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2014.
2. Ravi Prakash, “Non-Destructive Testing Techniques”, 1st revised edition, New Age International Publishers, 2010

### **REFERENCES:**

1. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.
2. ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbook, Vol. 1, Leak Testing, Vol. 2, Liquid Penetrant Testing, Vol. 3, Infrared and Thermal Testing Vol. 4, Radiographic Testing, Vol. 5, Electromagnetic Testing, Vol. 6, Acoustic Emission Testing, Vol. 7, Ultrasonic Testing
3. Charles, J. Hellier, “ Handbook of Nondestructive evaluation”, McGraw Hill, New York 2001.
  1. 4. Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley, 2nd Edition New Jersey, 2005

**19154E44DP RENEWABLE  
SOURCES OF ENERGY**

**UNIT – I: FACTORS AFFECTING ENERGY SOURCES: 9**

Primary energy sources - world energy resources- energy cycle of the earth –environmental aspects of energy utilisation, CO<sub>2</sub> emissions and Global warming–renewable energy resources and their importance. Potential impacts of harnessing the different renewable energy resources.

**UNIT – II: SOLAR ENERGY : 9**

Principles of Solar energy collection -Solar radiation - measurements - instruments - data and estimation- types of collectors - characteristics and design principles of different type of collectors - performance of collectors - testing of collectors. Solar thermal applications - water heaters and air heaters - performance and applications - simple calculations - solar cooling - solar drying - solar ponds - solar tower concept - solar furnace.

**UNIT – III: WIND, TIDAL AND GEO THERMAL ENERGY 9**

Energy from the wind - general theory of windmills - types of windmills - design aspects of horizontal axis windmills - applications. Energy from tides and waves – working principles of tidal plants and ocean thermal energy conversion plants - power from geothermal energy - principle of working of geothermal power plants.

**UNIT – IV: BIO ENERGY 9**

Energy from bio mass & bio gas plants -various types - design principles of biogas plants - applications. Energy from wastes - waste burning power plants - utilization of industrial and municipal wastes - energy from the agricultural wastes.

**UNIT – V: RECENT ADVANCEMENTS 9**

Direct energy conversion (Description, principle of working and basic design aspects only) – Magneto hydrodynamic systems (MHD) - thermoelectric generators – thermionic generators - fuel cells - solar cells - types,

**Total Hours : 45**

**TEXT BOOKS**

1. Rai G.D, “Non conventional Energy sources” (1999) Khanna Publishers, New Delhi
2. Ashok V Desai, “Non-conventional Energy”, Wiley Eastern Ltd, New Delhi, 1990

**REFERENCES**

1. Sukhatme, S.P., Solar Energy, 2<sup>nd</sup> edition, TMH, 2003
2. Sulton, “Direct Energy Conversion”, McGraw-Hill, 1966.
3. Duffie and Beckmann, “Solar Energy Thermal Processes, John Wiley, 1974.

**19158E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING**

**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.

## 19154E54BP COMPOSITE MATERIALS

### 1. INTRODUCTION TO COMPOSITES

8

Fundamentals of composites - need for composites – Enhancement of properties - classification of composites – Matrix-Polymer matrix composites (PMC), Metal matrix composites (MMC), Ceramic matrix composites (CMC) – Reinforcement – Particle reinforced composites, Fibre reinforced composites. Applications of various types of composites.

### 2. POLYMER MATRIX COMPOSITES

12

Polymer matrix resins – Thermosetting resins, thermoplastic resins – Reinforcement fibres – Rovings – Woven fabrics – Non woven random mats – various types of fibres. PMC processes - Hand lay up processes – Spray up processes – Compression moulding – Reinforced reaction injection moulding - Resin transfer moulding – Pultrusion – Filament winding – Injection moulding. Fibre reinforced plastics (FRP), Glass fibre reinforced plastics (GRP).

### 3. METAL MATRIX

## COMPOSITES

9

Characteristics of MMC, Various types of Metal matrix composites Alloy vs. MMC, Advantages of MMC, Limitations of MMC, Metal Matrix, Reinforcements – particles – fibres. Effect of reinforcement - Volume fraction – Rule of mixtures. Processing of MMC – Powder metallurgy process - diffusion bonding – stir casting – squeeze casting.

## 4. CERAMIC MATRIX COMPOSITES

9

Engineering ceramic materials – properties – advantages – limitations – Monolithic ceramics - Need for CMC – Ceramic matrix - Various types of Ceramic Matrix composites- oxide ceramics – non oxide ceramics – aluminium oxide – silicon nitride – reinforcements – particles- fibres- whiskers. Sintering - Hot pressing – Cold isostatic pressing (CIPing) – Hot isostatic pressing (HIPing).

## 5. ADVANCES IN COMPOSITES

7

Carbon /carbon composites – Advantages of carbon matrix – limitations of carbon matrix Carbon fibre – chemical vapour deposition of carbon on carbon fibre perform. Sol gel technique. Composites for aerospace applications.

**TOTAL : 45**

### TEXT BOOKS

1. Mathews F.L. and Rawlings R.D., “Composite materials: Engineering and Science”, Chapman and Hall, London, England, 1<sup>st</sup> edition, 1994.
2. Chawla K.K., “Composite materials”, Springer – Verlag, 1987

### REFERENCES

1. Clyne T.W. and Withers P.J., “Introduction to Metal Matrix Composites”, Cambridge University Press, 1993.
2. Sharma S.C., “Composite materials”, Narosa Publications, 2000.
3. “Short Term Course on Advances in Composite Materials, Composite Technology Centre, Department of Metallurgy”, IIT- Madras, December 2001.

## 19154E54CP ROBOTICS

### UNIT-I:

#### INTRODUCTION OF ROBOT BASICS

7

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

200

### UNIT-II: ROBOT

## ACTUATORS AND END

### EFFECTORS 10

Pneumatic Drives – Hydraulic Drives – Mechanical Drives – Electrical Drives – D.C. Servo Motors, Stepper Motor, 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 Internal Grippers and External Grippers;

### UNIT-III: SENSORS AND MACHINE VISION SYSTEM 10

Requirements of a sensor, Principles and Applications of the following types of sensors – Position of sensors - Piezo Electric Sensor, LVDT, Optical Encoders, Range Sensors, Proximity Sensors - Inductive, Hall Effect, Capacitive, Ultrasonic Touch Sensors, Sensing and Digitizing Image Data – Signal Conversion, Image Storage, Lighting Techniques. Image Processing and Analysis – Data Reduction, Segmentation, Feature Extraction, Object Recognition.

### UNIT-IV: ROBOT

### KINEMATICS AND ROBOT

### PROGRAMMING 10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional),

Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effector commands, and Simple programs

### UNIT – V:

### IMPLEMENTATION

### AND ROBOT ECONOMICS

8

RGV, AGV; Implementation of Robots in Industries – Various Steps; Safety Considerations for Robot Operations; Economic Analysis of Robots – Pay back Method, Rate of Return Method.

**Total Hours : 45**

### TEXT BOOKS:

1. M.P.Groover, "Industrial Robotics – Technology, Programming and Applications", McGraw-Hill, 2001

### REFERENCES

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw-Hill Book Co., 1987
2. Yoram Koren, "Robotics for Engineers", McGraw-Hill Book Co., 1992
3. Janakiraman.P.A., "Robotics and Image Processing", Tata McGraw-Hill, 1995

## 19154E54DP DESIGN OF JIGS, FIXTURES AND PRESS TOOLS

### UNIT-I: TYPES AND FUNCTIONS OF JIGS AND FIXTURES 8

Tool design objectives - Production devices - Inspection devices - Materials used in Jigs and Fixtures – Types of Jigs - Types of Fixtures-Mechanical actuation-pneumatic and hydraulic actuation-Analysis of clamping force.

### UNIT-II: JIGS 210 9

Drill bushes –different types of jigs-plate latch, channel, box, post, angle plate, angular post, turnover, pot jigs-. Air operated Jigs components. Design and development of Jigs for given components.

**UNIT-III: FIXTURES 9**

General principles of boring, lathe, milling and broaching fixtures- Grinding, planning and shaping fixtures, assembly, Inspection and welding fixtures- Modular fixtures. Design and development of fixtures for given component.

**UNIT-IV: PRESS WORKING 10**

Press working terminology-Presses and press accessories-Computation of capacities and tonnage requirements. Elements of progressive combination and compound dies:. Bolster plate-punch plate-punch holder-guide pins and bushes.

**UNIT-V: DESIGN AND DEVELOPMENT OF DIES 9**

Design and development of progressive and compound dies for Blanking and piercing operations. Bending dies – development of bending dies-forming and drawing dies-Development of drawing dies.

**Total Hours : 45**

(Use of approved design data book is permitted)

**TEXT BOOKS:**

1. Edward G Hoffman, “Jigs & Fixture Design”, Thomson – Delmar Learning, Singapore 2004
2. Donaldson. C, “Tool Design”, Tata McGraw-Hill, 1986

**REFERENCES:**

1. Kempster, “Jigs & Fixtures Design”, The English Language Book Society”, 1978
2. Joshi, P.H., “Jigs & Fixtures”, Second Edition, Tata McGraw-Hill Publishing Company Limited, New Delhi 2004
3. “Fundamentals of Tool Design”, CEEE Edition, ASTM, 1983
4. Design Data Handbook PSG College of Technology, Coimbatore

**19154E64AP UNCONVENTIONAL MACHINING PROCESSES**

**UNIT – I: INTRODUCTION: 5**

Non traditional machining Process – Introductions-Need–types- Brief overview of all techniques.

**UNIT – II: AJM, WJM & USM 10**

Abrasive Jet Machining – Water Jet Machining – Ultrasonic Machining. (AJM, WJM and USM). Working Principles – equipment used – Process parameters – MRR-Variation in techniques used – Applications.

**UNIT – III: EDM 8**

Electric Discharge Machining (EDM)- working Principles-equipments-Process Parameters-MRR-electrode / Tool – Power Circuits-Tool Wear – Dielectric – Flushing – Wire cut EDM – Applications.

**UNIT – IV: ECM & ECG 12**

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

**UNIT – V: LBM, PAM & EBM****10**

Laser Beam machining (LBM), plasma Arc machining (PAM) and Electron Beam Machining (EBM). Principles-Equipment-Types-Beam control techniques – Applications.

**Total Hours : 45****TEXT BOOKS:**

1. Vijay.K. Jain “Advanced Machining Processes” Allied Publishers Pvt. Ltd., New Delhi (2002) ISBN 81-7764-294-4.
2. Benedict. G.F. “Nontraditional Manufacturing Processes” Marcel Dekker Inc., New York (1987).

**REFERENCES:**

1. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi (1980).
2. Mc Geough, “Advanced Methods of Machining” Chapman and Hall, London (1998).

**19154E64BP NUCLEAR ENGINEERING****UNIT-I: NUCLEAR PHYSICS****9**

Nuclear model of an atom-Equivalence of mass and energy-binding- radio activity-half life-neutron interactions-cross sections.

**UNIT-II: NUCLEAR REACTIONS AND REACTION MATERIALS 9**

Mechanism of nuclear fission and fusion- radio activity- chain reactions-critical mass and composition-nuclear fuel cycles and its characteristics-uranium production and purification- Zirconium, thorium, beryllium.

**UNIT-III: REPROCESSING****9**

Reprocessing: nuclear fuel cycles-spent fuel characteristics-role of solvent extraction in reprocessing- solvent extraction equipment.

**UNIT-IV: NUCLEAR REACTOR****9**

Nuclear reactors: types of fast breeding reactors-design and construction of fast breeding reactors-heat transfer techniques in nuclear reactors- reactor shielding. Fusion reactors.

**UNIT-V: SAFETY AND DISPOSAL****9**

Safety and disposal: Nuclear plant safety-safety systems-changes and consequences of accident-criteria for safety-nuclear waste-types of waste and its disposal-radiation hazards and their prevention-weapons proliferation.

**Total Hours : 45****TEXT BOOKS :**

1. Thomas J.Cannoly, “Fundamentals of nuclear Engineering” John Wiley 1978.



## REFERENCES:

1. Collier J.G., and Hewitt G.F, "Introduction to Nuclear power", Hemisphere publishing, New York. 1987
2. Wakil M.M.El., "Power Plant Technology" – McGraw-Hill International, 1984.

# 19154E64CP INTELLECTUAL PROPERTY RIGHTS

## 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**

## TEXT BOOKS:

1. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012

## 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.
1. 3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

## 19148E64DP MATHEMATICS FOR INDUSTRIAL OPERATIONS

### **Unit I Introduction to Linear Programming (LP)**

Introduction to applications of operations research in functional areas of management. Linear Programming – formulation, solution by graphical and simplex methods (Primal – Penalty, Two Phase),

Special cases, Sensitivity Analysis.

## **Unit II            Transportation and Assignment models**

Transportation Models (Minimizing and Maximizing Cases) – Balanced and unbalanced cases – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods. Check for optimality. Solution by MODI / Stepping Stone method. Cases of degeneracy. Transportation Models. Assignment Models (Minimizing and Maximizing Cases) – Balanced and Unbalanced Cases. Solution by Hungarian and Branch and Bound Algorithms. Travelling Salesman problem. Crew Assignment Models.

## **Unit III            Integer Linear Programming and Game Theory**

Solution to pure and mixed integer programming problem by Branch and Bound and cutting plane algorithms. Game Theory – Two person zero sum games – Saddle point, Dominance Rule, Convex Linear Combination (Averages), methods of matrices, graphical and L.P. Solutions.

## **Unit IV Dynamic Programming, Simulation and Decision Theory**

Dynamic Programming (DP) – Deterministic Cases – Maximizing and Minimizing problems. DP techniques for L.P. problems, decision making under risk – decision trees – decision making under uncertainty. Application of simulation techniques for decision making.

## **Unit V Queuing Theory and Replacement Models**

Basic elements of the Queuing Model, of the Poisson and Exponential Distributions, Queuing with combined arrivals and departures, Queues with priorities for service, P.E.R.T. & C.P.M. and replacement model: drawing networks – identifying critical path – probability of completing the project within given time – project crashing – optimum cost and optimum duration.

**Total no. of hrs: 60 hrs.**

### **TEXT BOOK**

1. K. Kannan, Operation Research, Anuradha publication
2. Hamdy, A. Taha, Operation Research: An Introduction, Prentice-Hall of India; New Delhi 2007.
3. Premkumar Gupta, Hira, Operations Research, S. Chand, 2008

### **REFERENCES BOOKS**

1. J. K Sharma, Operations Research: Theory and Applications, Macmillan India, 2007.
2. Barry Render, Ralph M. Stair. Jr. Michael E. Hanna, Quantitative Analysis for Management, 9/e PHI Pvt. Ltd New Delhi 2007.
3. N.D. Vohra, Quantitative Techniques in Management, TMH, New Delhi, 2007
4. Winston, Operations Research, Cengage, 2008.

## **19160E74AP QUALITY CONTROL AND RELIABILITY ENGINEERING**

### **UNIT - I : INTRODUCTION 10**

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality cost-Variation in process- factors – process capability – process capability studies and simple problems –

**UNIT - II : CONTROL CHARTS FOR VARIABLES AND ATTRIBUTES 8** Theory of Control chart- variables-X- chart, R –chart, control chart for attributes –control chart for proportion or fraction defectives – p chart and np chart

### **UNIT-III : ACCEPTANCE SAMPLING 9**

Lot by lot sampling – types – probability of acceptance in single, double, – O.C. curves – producer's Risk and consumer's Risk. AQL, LTPD, AOQL concepts- - uses of standard sampling plans.

**UNIT –IV: LIFE TESTING - RELIABILITY****9**

Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems.

**UNIT-V : QUALITY AND RELIABILITY****9**

Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability

**Total Hours : 45**

**Note :** Use of approved Statistical table permitted in the examination.

**TEXT BOOKS:**

1. R.C.Gupta, “Statistical Quality control”, Khanna Publishers, 1997.
2. L.S.Srinath, “Reliability Engineering”, Affiliated East west press, 1991.

**REFERENCES:**

1. Monohar Mahajan, “Statistical Quality Control”, Dhanpat Rai & Sons, 2001
2. Besterfield D.H., “Quality Control”, Prentice Hall, 1993.
3. Sharma S.C., “Inspection Quality Control and Reliability”, Khanna Publishers, 1998.

**19154E74BP VIBRATION AND NOISE CONTROL****1. BASICS OF VIBRATION****9**

Introduction, classification of vibration: free and forced vibration, undamped and damped vibration, linear and non linear vibration, response of damped and undamped systems under harmonic force, analysis of single degree and two degree of freedom systems.

**2. BASICS OF NOISE****9**

Introduction, amplitude, frequency, wavelength and sound pressure level, addition, subtraction and averaging decibel levels, noise dose level, legislation, measurement and analysis of noise, measurement environment, equipment, frequency analysis,

**3. AUTOMOTIVE NOISE SOURCES****9**

Noise Characteristics of engines, engine overall noise levels, assessment of combustion noise, assessment of mechanical noise, engine radiated noise, intake and exhaust noise, engine accessory contributed noise, transmission noise, brake noise.

**4. CONTROL TECHNIQUES****9**

Vibration isolation, tuned absorbers, un tuned viscous dampers, damping treatments, application dynamic forces generated by IC engines, engine isolation, crank shaft damping, modal analysis of the mass elastic model shock absorbers.

**5. SOURCE OF NOISE AND CONTROL****9**

Methods for control of engine noise, combustion noise, mechanical noise, predictive analysis, palliative treatments and enclosures, automotive noise control principles, sound in enclosures, sound energy absorption.

**TOTAL : 45****TEXT BOOKS**

1. Singiresu S.Rao - “Mechanical Vibrations” - Pearson Education, ISBN –81-297-0179-0 - 2004.
2. Kewal Pujara “Vibrations and Noise for Engineers, Dhanpat Rai & Sons, 1992.

**REFERENCES**

217

1. Bernard Challen and Rodica Baranescu - "Diesel Engine Reference Book" - Second edition - SAE International - ISBN 0-7680-0403-9 – 1999.
2. Julian Happian-Smith - "An Introduction to Modern Vehicle Design"- Butterworth-Heinemann, ISBN 0750-5044-3 - 2004
3. John Fenton - "Handbook of Automotive body Construction and Design Analysis - Professional Engineering Publishing, ISBN 1-86058-073- 1998.

## **19160E74CP PRINCIPLES OF MANAGEMENT (COMMON TO ALL BRANCHES)**

### **UNIT I - Nature of Management 9**

Definitions, meaning, scope, administration and management - Science and art Mgmt as a profession, University of management Hierarchy (Top, middle and supervisory, Levels), Principles of Management

### **UNIT II - Development of Management Thought 9**

Taylor and Scientific Management, Principles of Scientific Management Contributions of fayol, Barnard and social system theory, Contributions of Herbert Simon, Contributions of Peter Drucker, Contributions of behavioral scientists ,Contribution of system scientists

### **UNIT III - Planning and organizing 9**

Definition and features of planning, Nature of planning, Importance of planning  
Types of planning, Steps in planning. Management by objectives, Strategies and policies, Definition of organization, Importance of organization, Principles of organization, Span of management

### **UNIT IV - Direction and Coordination 9**

Meaning, definition, principles of direction, Techniques of direction - Meaning of supervision, Functions of supervisor, Meaning of coordination Element and features of coordination, Importance of coordination Cooperation and coordination systems approach Steps for effective coordination Meaning and causes of conflicts, Management of conflicts

### **UNIT V – Controlling 9**

Definition, Meaning .elements, steps in establishing control procedure Control Techniques, Requirements of good control systems Budget –meaning, definitions, types Zero based budgeting, responsibility accounting, budgetary control, Report –meaning types PERT and CPM Management by Exception

**Total Hours: 45**

#### **Textbooks:**

1. Prasad L.M ., Principles and practice of Management ,New Delhi Sultan Chand and sons ,1998

#### **References:**

1. saxena ,s.c principles and practice of management Agra : sahitya bhawan 1998
2. Koontz Harold and others ,Management New York :McGraw Hill 1980
3. stoner james and others ,Management ,New Delhi :PHI ,1997
4. Dale Yoder : Personnel Management and industrial Relations ,New Delhi PHI 1974

## **19154E74DP INDUSTRIAL ENGINEERING**

### **Unit I Introduction to Industrial Engineering**

Introduction to Industrial Engineering – Evolution of modern Concepts in Industrial Engineering – Functions of Industrial Engineering – Field of application of Industrial Engineering Product Development and research- Design function – Objectives of design- Manufacturing Vs purchase- Development of designs- Experimentation- prototype production and testing simplification and standardization – Selection of materials and processes- Human factors in design- value Engineering job plan.

### **Unit II Plant layout**

Plant layout - Types of layouts- Product, process, fixed, Group technology, Flexible manufacturing system- elementary concepts and structure, flow charts, use of time study data, physical facilities- Constructional details- environmental control like lighting, temperature, humidity, Ventilation, noise and dust, Industrial waste disposal-

### **Unit III - Material handling**

Principles of material handling- Types of material handling equipments- Selection and application maintenance and replacements- Preventive and brake- down maintenance and replacement- Preventive and brake- down maintenance- economic aspect, Replacement of equipment- Method of providing for depreciation- Determination of economic life, Criteria for selection of equipment- Simple problem.

### **Unit IV Organization.**

Principles of organization, Development of Organizational charts like line, staff, line and staff & functional types. Resources, Human relationship. Factory acts, payment of wages, workmen compensation, E.S.I. Sales management & forecasting cost accounting, Budgetary control. , partnership, Joint stock & co-operative stores.

### **Unit V Labour welfare and Industrial Safety**

Workers participation in management- Labour welfare and social security- Industrial safety- Important statutory provisions in labour legislation. Safety engineering, accident prevention program , safety design concepts, fire protection-industrial noise-Legislations on safety in industry . Recent Developments in maintenance methods-RCM- CBM –DMS – TPM etc.

### **References:**

1. Industrial Engineering and Management - O. P. Khanna
2. Industrial Engineering & Production Management, M Mahajan - Dhanpat Rai (pub).
3. Industrial Engineering - Dr. B. Kumar – Khanna pub.

# **DEPARTMENT OF MECHANICAL ENGINEERING**

# PROGRAMME HANDBOOK

## M.Tech. – Manufacturing Technology FULL TIME PROGRAMME Regulation 2019

### Semester - 1

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19248S11E	Advanced Engineering Mathematics	3	1	-	4
19254C12	Theory of Metal Cutting	4	-	-	4
19254C13	Advanced Manufacturing Processes	4	-	-	4
19254C14	Mechanical Metallurgy	4	-	-	4
19254C15	Automated Computer Integrated Manufacturing Systems	4	-	-	4
19254E16_	Elective – I	3	-	-	3
19254L17	CIM Lab	-	-	3	3
19254CRS	Research Led Seminar				1
<b>TOTAL NO. OF CREDITS</b>					<b>27</b>

### Semester - 2

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254C21	Production Management	4	-	-	4
19254C22	MEMS and Nano Technology	4	-	-	4



19254C23	Manufacturing Metrology and Quality Control	4	-	-	4
19254E24_	Elective - II	3	-	-	3
19254E25_	Elective - III	3	-	-	3
19254L26	Automation Lab	-	-	3	3
192TECWR	Technical Writing/Seminar	-	-	3	3
19254CRM	Research Methodology	3	-	-	3
19254CBR	Participation in Bounded Research				2
<b>TOTAL NO. OF CREDITS</b>					<b>29</b>

### Semester - 3

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254C31	Metal Forming Process	4	-	-	4
19254E32_	Elective - IV	3	-	-	3
19254E33_	Elective - V	3	-	-	3
19254E34_	Elective - VI	3	-	-	3
19254P35	Project Work Phase - I	-	-	10	10
19254CRS	Design Project /Socio- Technical Project	6	-	-	6
<b>TOTAL NO. OF CREDITS</b>					<b>29</b>

### Semester – 4

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
	221				

19254P41	Project Work Phase - II	-	-	15	15
<b>TOTAL NO. OF CREDITS</b>					<b>15</b>

**ELECTIVE –I**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E16A	Materials Management and Logistics	3	-	-	3
19254E16B	Financial Management	3	-	-	3
19254E16C	Manufacturing Information Systems	3	-	-	3

**ELECTIVE –II**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E24A	Finite Element Application in Manufacturing	3	-	-	3
19254E24B	Lean Manufacturing	3	-	-	3
19254E24C	Design and Analysis of Experiments	3	-	-	3

**ELECTIVE –III**

Course Code	Title of Paper	L	T	P	C
19254E25A	Advanced Metrology and Computer Aided Inspection	3	-	-	3
19254E25B	Maintenance Management	3	-	-	3
19254E25C	Optimization Techniques	3	-	-	3

**ELECTIVE –IV**

Course Code	Title of Paper	L	T	P	C
19254E32A	Manufacturing Systems and Simulation	3	-	-	3
19254E32B	Instrumentation and Control Engineering	3	-	-	3
19254E32C	Artificial Intelligence and Neural Networks	3	-	-	3

#### ELECTIVE -V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E33A	Product Design and Development	3	-	-	3
19254E33B	Fluid Power Automation	3	-	-	3

#### ELECTIVE -VI

Course Code	Title of Paper	L	T	P	C
19254E34A	Advanced Material Technology	3	-	-	3
19254E34B	Industrial Ergonomics	3	-	-	3

Total No of Credits - 100

DEPARTMENT OF MECHANICAL ENGINEERING

M.Tech., MANUFACTURING TECHNOLOGY –  
FULL TIME PROGRAMME  
SYLLABI-REGULATIONS- 2019

#### I - SEMESTER

19248S11E - ADVANCED ENGINEERING MATHEMATICS 3 1 0 4

LAPLACE TRANSFORM:

223

9+3

Laplace transform methods for one-dimensional wave equation – Displacement in a long string – longitudinal vibration of an elastic bar – Laplace equation – properties of harmonic functions.

**FOURIER TRANSFORM:**

**9+3**

Fourier transforms methods for one – dimensional heat conduction problems in infinite and semi infinite rod – Fourier transform methods for Laplace equation.

**PROBABILITY OF DISTRIBUTION:**

**9+3**

Probability – definition and introduction – random variable – probability density functions – study of standard distributions: Binomial, poisson, normal exponential and weibull distributions – Applications – Baye’s theorem.

**TESTING OF HYPOTHESIS:**

**9+3**

Testing of Hypothesis – Parametric test – Small samples – Test related proportion, Means, Standard deviation – Test based on chi-square, Goodness of fit and test of independence.

**THEORY OF ESTIMATION**

**9+3**

Principles of least squares – Multiple and partial correlation and regression – Estimation of parameters – Method of moments.

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

**BOOKS FOR REFERENCES:**

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and Llberman

**19254H12 - THEORY OF METAL CUTTING**

**4 0 0 4**

**OBJECTIVE:**

To know about the mechanics of chip formation, to analyse the tool failure, and thermodynamics involved in metal cutting and evaluation of tool materials.

**UNIT- I: Orthogonal Cutting:**

**12**

Orthogonal Cutting – Theories of merchant – Lee and Shaffer – Merchant’s circle diagram – shear angle relationship – chip velocity – force – velocity relationships

**UNIT-II: Chip Formation:**

**12**

Mechanism of chip formation – Types of Chips – discontinuous,continuous continuous with BUE – Chip Formation in drilling and Milling – effect of cutting variables of chip reduction coefficient.

**UNIT-III : Tool Life and Machinability:**

**12**

Tool Failure:Mode of Plastic failure – Measurement of tool wear – tool life tests – tool life equation for variable theories – variables affecting tool life – machinability – machinability index – problems.

**UNIT-IV: Thermal Analysis in Metal Cutting:**

**12**

Thermodynamics of orthogonal cutting – analysis of temperature at shear plane and tool face – experimental methods for temperature measurement.

**UNIT-V: Chatter:**

**12**

Chatter - Importance of Chatter in machining – types of chatter – avoidance of chatter. Tools materials – requirements – alloy tools - HSS – carbides –PCD and CBN- properties and application.

**TOTAL: 60 PERIODS**

**BOOKS FOR REFERENCES:**

1. Juneja .B.L, “Fundamentals of Metal cutting and Machine tools”, New Age International, 1995.
2. Bhattacharya.A, “Metal Cutting Theory and Practice”, Central book publications.
3. Kuppusamy .G, “Principle of Metal Cutting”, University Press, 1996.
4. Shaw .M.C, “Metal Cutting Principles”, I BH Publications, 1992.
5. Armarego E.J.A and Brown R.H, “The Machining of Metals”, Prentice Hall, 1969

**9254H13**

**ADVANCED MANUFACTURING PROCESSES**

**4 0 0 4**

**AIM:**

To expose the students in the art of manufacturing new products due to the development of new materials and processes. The students will totally get a feel of the relevant suitable process while evaluating and deciding.

**OBJECTIVE:**

- To inform the students about the various alternative manufacturing processes available.
- To develop an altitude to look for the unconventional manufacturing process to machine
- To make them to understand and appreciate the latest manufacturing process for micro fabrication and devices.

**UNIT I NEWER MACHINING PROCESSES - I**

**12**

(Non thermal energy) – Abrasive machining – water jet machining - ultrasonic machining – chemical machining – electro chemical machining – construction working principle – steps - types – process parameters – derivations – problems, merits, demerits and applications .

**UNIT II NEWER MACHINING PROCESS – II**

**12**

Wire cut EDM - Electro chemical machining – ECG - Electric discharge machining – construction – principle – types – control - circuits – tool design – merits, demerits & applications.

**UNIT III NEWER MACHINING PROCESS – III**

**12**

Laser beam machining – Electron beam machining – Plasma arc machining – Ion beam machining – construction working principle types – process parameter – derivations – problems, merits, demerits and applications.

**UNIT IV FABRICATION OF MICRO DEVICES**

**12**

Semiconductors – films and film depurification – Oxidation - diffusion – ion implantation – etching – metallization – bonding – surface and bulk machining – LIGA Process – Solid free form fabrication.

## UNIT V MICROFABRICATION TECHNOLOGY

12

Wafer preparation – monolithic processing – moulding – PCB board hybrid & mcm technology – programmable devices & ASIC – electronic material and processing.– steriolithography SAW devices, Surface Mount Technology,

**TOTAL: TOTAL: 60 PERIODS**

### BOOKS FOR REFERENCES:

1. Serope kelpelijian & stevan r. schmid- manufacturing process engg material – 2003
2. Micro sensors Mems & smart devices- Julian W.Hardner – 2002
3. Brahem T. Smith, Advanced machining I.F.S. UK 1989.
4. Jaeger R.C., Introduction to microelectronic fabrication Addison Wesley, 1988.
5. Nario Taniguchi – Nano technology – Oxford University Press 1996.
6. Pandey P.C. & Shan HS Modern Machining Processes, Standard Publishing Co., 1980
7. More Madon, Fundamentals of Microfabrication, CRC Press, 1997.

**19254H14**

**MECHANICAL METALLURGY**

**4 0 0 4**

### OBJECTIVE:

To study about the behaviour of Metals during the loading conditions related to distribution of Stress and Strain. To know about the fracture of metals and various test procedures.

### UNIT-I: Tensile Study:

12

Study of Engineering stress-strain curve: Derivation of tensile strength, yield strength ductility, Young's modulus, resilience and toughness from stress strain curves, study of stress-strain curves for different materials-true stress-strain curve: true stress at ultimate load, true fracture strain, true uniform strain, true necking strain-necking factor-effect of strain rate, temperature- test of flow properties-Notch tensile test-tensile properties of steel-strengthening theory- strain hardening-strain aging-Yield point phenomena-Solid solution strengthening-Martensite strengthening-Grain refinement,

### UNIT-II: Hardness and Toughness:

12

Hardness and Toughness: Hardness introduction, Hardness measurement methods-Brinell hardness, Meyer hardness, Vickers hardness, Rockwell hardness and Micro hardness-Relationship between hardness and the flow curve-Hardness at higher temperatures-Toughness –introduction, Toughness measurements: Charpy, Izod and instrumented Charpy-TTT curves: Significance, metallurgical factors affecting the curves, Drop weight test, explosion crack starter test.

### UNIT-III: Fatigue:

12

Fatigue study: Introduction: Different stress cycles, S-N curves, Goodman diagram, Soderberg diagram, Gerbar diagram-Cyclic stress curve-Low cycle fatigue- Strain life equation-Fatigue mechanism-High cycle fatigue-Effect of following parameters on fatigue: Mean stress, stress concentration, specimen size, surface roughness, residual stress, micro structure and temperature. Fatigue crack propagation.

### UNIT-IV: Fracture Behaviour:

12

Fracture – Introduction –Types – Ductile and Brittle Cohesive Strength of Metals- Griffith Theory- Metallographic Examination of Fracture – Fractography – Notch Effect – Concept of Fracture curve – Fracture under combined stresses- Environment sensitive fracture: Hydrogen Embrittlement and Corrosion Cracking

**UNIT-V: Creep:****12**

Creep: Creep Curve – Stress rupture test- Structural changes during creep- Creep deformation- Deformation Mechanisms Maps – Activation Energy for Steady state creep – Fracture at higher temperatures.

**TOTAL: 60 PERIODS****BOOKS FOR REFERENCES:**

1. George E. Dieter, “Mechanical Metallurgy”, Mc Graw Hill, NewYork, 1988.
2. M.A. Meyers and K.Chawla, “Mechanical Metallurgy”, PHI.
3. Metals Hand Book, “Mechanical Testing”, Vol. 8, 9<sup>th</sup> Ed., ASM.
4. Thomas Countney.H., “Mechanical Behaviour of Materials”,McGraw Hill, 2<sup>nd</sup> Ed., 2000.
5. Hertzberg R.W., “Deformation and Fracture Mechanics of Engineering Materials”, 2<sup>ne</sup> Ed., John Wiley & Sons. 1983.

**19254H15 AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS 4 0 0 4****AIM:**

To stress the role of computers in production.

**OBJECTIVE:**

To teach the role of computers in processing the information knowing across the various Stages and various departments in a manufacturing concern.

**UNIT I INTRODUCTION****10**

Introduction to CAD, CAM, CAD/CAM and CIM - Evolution of CIM – CIM wheel and cycle – Production concepts and mathematical models – Simple problems in production models – CIM hardware and software – Major elements of CIM system – Three step process for implementation of CIM – Computers in CIM – Computer networks for manufacturing – The future automated factory – Management of CIM – Impact of CIM on personnel – CIM status.

**UNIT II AUTOMATED MANUFACTURING SYSTEMS****14**

Automated production line – system configurations, work part transfer mechanisms – Fundamentals of Automated assembly system – System configuration, Part delivery at workstations – Design for automated assembly – Overview of material handling equipments – Consideration in material handling system design – The 10 principles of Material handling. Conveyor systems – Types of conveyors – Operations and features. Automated Guided Vehicle system – Types of vehicles and AGVs applications – Vehicle guidance technology – Vehicle management and safety. Storage system performance – storage location strategies – Conventional storage methods and equipments – Automated storage/Retrieval system and Carousel storage system Deadlocks in Automated manufacturing systems – Petrinet models – Applications in Dead lock avoidance.

**UNIT III GROUP TECHNOLOGY AND FMS****14**

Part families – Visual – Parts classification and coding – Production flow analysis – Grouping of parts and Machines by rank order clustering method – Benefits of GT – Case studies. FMS – Components – workstations – FMS layout configurations – Computer control systems – FMS planning and implementation issues – Architecture of FMS – flow chart showing various operations in FMS – Machine cell design – Composite part concept, Holier method, Key machine concept – Quantitative analysis of FMS – Bottleneck model – Simple and complicated problems – Extended Bottleneck model - sizing the FMS, FMS applications, Benefits.

**UNIT IV PROCESS PLANNING****12**

Process planning – Activities in process planning, Information's required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes –

selecting among casting process, forming process and machining process. Sequencing of operations according to Anteriorities – various examples – forming of Matrix of Anteriorities – case study. Typical process sheet – case studies in Manual process planning. Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning.

## **UNIT V TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE 10**

Introduction to process model formulation – linear feedback control systems – Optimal control – Adaptive control – Sequence control and PLC. Computer process control – Computer process interface – Interface hardware – Computer process monitoring – Direct digital control and Supervisory computer control. Overviews of Automatic identification methods – Bar code technology – Other Automatic data capture technologies.

**TOTAL: 60 PERIODS**

### **BOOKS FOR REFERENCES:**

1. Mikell P. Groover, "Automation, Production system and Computer integrated Manufacturing", Prentice Hall of India Pvt. Ltd., 2008.
2. Radhakrishnan, P., Subramanian, S., and Raju, V., "CAD/CAM/CIM" New Age International Publishers, 2000.
3. James A. Retrg, Herry W. Kraebber, "Computer Integrated Manufacturing", Pearson Education, Asia, 2001.
4. Viswanathan, N., and Narahari, Y., "Performance Modeling and Automated Manufacturing Systems", Prentice Hall of India Pvt. Ltd., 2000.
5. Alavudeen and Venkateshwaran, "Computer Integrated Manufacturing", PHI Learning Pvt. Ltd., New Delhi, 2008.

**19254L19**

**CIM LAB**

**0 0 3 3**

### **AIM:**

To impart the knowledge on training the students in the area of CAD/CAM.

### **OBJECTIVES:**

To teach the students about the drafting of 3D components and analyzing the same using various CAD/CAM software's.

### **CAM LABORATORY**

1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving & canned cycle
2. Exercise on CNC Milling Machine: Profile Milling, Mirroring, Scaling & canned cycle.
3. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.
4. Mini project on any one of the CIM elements is to be done. This can be either a software or hardware simulating a CIM element. At the end of the semester, the students has to submit a mini report and present his work before a Committee.

### **CAD LABORATORY**

2D modeling and 3D modeling of components such as

1. Bearing
2. Couplings
3. Gears
4. Sheet metal components

228



5. Jigs, Fixtures and Die assemblies.

**TOTAL: 30 PERIODS.**

**SEMESTER II**

**19254H21**

**PRODUCTION MANAGEMENT**

**4 0 0 4**

**OBJECTIVE:**

To gain knowledge in operation management principles and the related quantitative approaches.

**UNIT-I : Manufacturing System:**

**12**

The concept of system - types of manufacturing system- the concept of a model - model classification - model building - decision making approaches. Forecasting: qualitative and quantitative methods - moving averages- single and multiple regression models.

**UNIT-II : Aggregate Planning :**

**12**

Methods of aggregate planning- graphical and charting methods, trial and error, transportation method- concepts of linear decision rule.

**UNIT-III: Inventory Management Systems and Models**

**12**

EOQ, model (without and with shortages)- inventory models allowing price breaks, EPQ model - single period inventory model - inventory control systems - P,Q and S-s system - selective inventory control techniques.

**UNIT-IV: MRP & JIT:**

**12**

Materials requirement planning (MRP) - master production schedule, bill of materials, MRP concepts, lot sizing - lot-for-lot technique, EOQ approach, silver-meal approach, period order quantity approach, least unit cost approach, least total cost approach. Principles of JIT production pull and push system, kanban, JIT purchasing, supply chain management.

**UNIT-V: Scheduling:**

**12**

Scheduling and assignment problems - notation and definitions - criteria, objective functions for scheduling - job shop scheduling: sequencing of n jobs through 1 machine - priority rules, n jobs through 3, m machines - Johnsons rule, CDS algorithm, 2 jobs on m machine - graphical method- multi product assignment problem - index method, Hungarian method.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. Production Operation Management:Theory And Problems, Chary:S.N, TMH, New delhi,1990.
2. Production Operation Management, Pannerselvam.R, PHI, 1999.

**REFERENCE BOOKS:**

1. Operation Management Theory And Problems, Monks.J,G., McGraw HILL,1987.
2. Production operation management, chase.R.B,. Aquiliano.N.J and Jacobs.R.R.,8<sup>th</sup> Edition, TMH, 1988.
3. Production Planning And Inventory Control, Narashimhan. S.L., Mcleavy.D.W.,and Billington.P.J., 2<sup>nd</sup> Edition., PHI,1997

**AIM:**

To inspire the students to expect to the trends in manufacturing micro components and measuring systems to nano scale.

**OBJECTIVES:**

- To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be aware of micro actuators.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

**UNIT I OVER VIEW OF MEMS AND MICROSYSTEMS****10**

Definition – historical development – fundamentals – properties, micro fluidics, design and fabrication micro-system, microelectronics, working principle and applications of micro system.

**UNIT II MATERIALS, FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING****14**

Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds silicon piezo resistors, Gallium arsenide, quartz, polymers for MEMS, conductive polymers. Photolithography, photo resist applications, light sources, in implantation, diffusion process exudation – thermal oxidation, silicon diode, chemical vapour deposition, sputtering - deposition by epitaxy – etching – bulk and surface machining – LIGA process Micro system packaging – considerations packaging – levels of micro system packaging die level, device level and system level.

**UNIT III MICRO DEVICES AND MATERIALS****12**

Sensors – classification – signal conversion ideal characterization of sensors micro actuators, mechanical sensors – measurands displacement sensors, pressure and flow sensors, micro actuators – smart materials – applications.

**UNIT IV SCIENCE OF NANO MATERIALS****12**

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.

**UNIT V CHARACTERIZATION OF NANO MATERIALS****12**

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

**TOTAL: 60 PERIODS****BOOKS FOR REFERENCES:**

1. Tai – Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.
2. Mark Madou Fundamentals of Microfabrication, CRC Press, New York, 1997.
3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003
4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.
5. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003
6. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

**AIM:**

To expose the students, the importance of measurement and the various latest measuring techniques using Laser, Coordinate measuring machines and Optoelectronics devices. Also to stress upon the Importance of quality in manufacturing.

**OBJECTIVES:**

To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices. Also to make the students to understand quality

**UNIT – I LASER METROLOGY 11**

Introduction – types of lasers – laser in engineering metrology – metrological laser methods for applications in machine systems – Interferometry applications – speckle interferometry – laser interferometers in manufacturing and machine tool alignment testing – calibration systems for industrial robots laser Doppler technique – laser Doppler anemometry.

**UNIT – II PRECISION INSTRUMENTS BASED ON LASER 11**

Laser telemetric systems – detection of microscopic imperfections on high quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high inertia laser scan technique – rotating mirror technique – laser gauging – bar coding – laser dimensional measurement system.

**UNIT – III CO-ORDINATE MEASURING MACHINE 14**

Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors – displacement devices – Performance Evaluations – Software – Hardware – Dynamic errors – Thermal effects diagram – temperature variations environment control – applications.

**UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 12**

Opto electronic devices – CCD – On-line and in-process monitoring in production – applications image analysis and computer vision – Image analysis techniques – spatical feature – Image extraction – segmentation – digital image processing – Vision system for measurement – Comparison laser scanning with vision system.

**UNIT – V QUALITY IN MANUFACTURING ENGINEERING 12**

Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

**TOTAL: 60 PERIODS****REFERENCES:**

1. John A. Bosch, Giddings and Lewis Dayton, Co-ordinate Measuring Machines and Systems, Marcel Dekker, Inc, 1999.
2. Juran J.M. and Gyna F.M., Quality Planning and Analysis, Tata-McGraw Hill, New Delhi
3. Zuech, Nello Understanding and Applying Machine Vision, Marcel Dekker, Inc, 2000
4. Elanchezhian.C, Vijaya Ramnath.B and Sunder Selwyn, T., Engineering Metrology, Eswar Press, Chennai, 2004.

**AIM:**

To impart knowledge in the area of hydraulic and pneumatic components and its functions.

**OBJECTIVE:**

- To make the students to learn the basic concepts of hydraulics and pneumatics and its applications in the area of manufacturing process.
- To simulate the various hydraulics and pneumatics circuits.

**EXPERIMENTS:**

1. Simulation of single and double acting cylinder circuits
2. Simulation of Hydraulic circuits
3. Simulation of electro pneumatic circuits
4. Simulation of electro hydraulic circuits
5. Simulation of PLC circuits
6. Exercises on linear and angular measurements
7. Exercises on speed measurements
8. Exercises on Vibration measurements
9. Exercises on Motion controller using servo motors, encoders, etc.
10. Exercises on fiber optics transducers.
11. Exercises on stepper motor.
12. Exercises on microprocessor based data acquisition system.
13. Software simulation of fluid power circuits using Automation studio.

**TOTAL : 30 PERIODS****192TECWR****Technical Writing/Seminar  
0 3 3****0**

Seminar should be based on the literature survey on any topic relevant to CAD/CAM/CAE. It may be leading to selection of a suitable topic of dissertation. The report shall contain some contribution by the candidate in the form of experimental results, deductions, compilation and inferences etc.

- Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department.
- The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar.

**19219254CRM****Research Methodology****AIM:****3 0 0 3**

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:**

232

- 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**

**9**

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**

**9**

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**

**9**

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**

**9**

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**

**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

**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 Vidyalyaya 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 III**

**19254H31 METAL FORMING PROCESS 4 0 0 4**

**OBJECTIVE:**

To study about the response of materials under plastic deformation and the various techniques for finding the stress for various metal working processes, and the recent developments in high speed forming.

**UNIT-I: Stress and Strain: 10**

Stress-State of stress in two dimensions – three dimensions – stress tensor-Mohr’s circles – 2D and 3D state of stress – Description of strain at a point – Mohr’s circle of strain- Hydrostatic and stress deviator component of stress- Plasticity- flow curve- true and true strain yield criteria for ductile loads combined stress test-plastic stress and strain relations- Levy Mises equations-Prandly\_Resus equations.

**UNIT-II: Analysis of Metal Forming: 14**

Work Load analysis – work formula for homogeneous deformation- rolling, rod drawing and extrusion processes -Determination of load by stress evaluation method-Determination of drawing load – strip drawing with wedge shaped dies and cylindrical rod drawing with a conical die.

**UNIT-III: Stress Evaluation: 12**

Stress evaluation method-Determination of forging load-plane strain forging of a thin strip and a flat circular disc- Determination of extrusion load for round band flat strip- upper bound analysis – plane strain indentation with frictionless interface

**UNIT-IV: High velocity Forming:****12**

Study of effect of high speed on stress strain relationships- High velocity forming equipment- Description of high speed forming machine – hot forging, pneumatic-mechanical, high velocity forging – Fuel combustion process- Electro magnetic forming –Introduction- Procedure - process variables- Applications

**UNIT-V: Advanced Forming process:****12**

Explosive Forming – Explosives – characteristics- stand off and contact operations- stress waves and their effects- process variables – properties of formed components- applications- Electro hydraulic forming – principles, requirements and characteristics – process variables- water hammer forming- principles and parameters- governing the process.

**BOOKS FOR REFERENCES:**

1. George E.Dieter, “Mechanical Metallurgy”, Mc Graw Hill International Edition, New York,1988
2. Rowe G.W,Edward , “An Introduction to the Principles of Metal Working”, Edward Arnold publications.
3. Davies.R and Austin.E.R, “Developments in High Metal Forming”, The Machinery Publishing Co.Ltd
4. Robert H.Wagoner and Jean Loup Chenot, “Fundamentals of Metal Forming”, John Wiley and Sons Inc, New York,1992

**List of Electives - Elective I****19254E16A****MATERIALS MANAGEMENT AND LOGISTICS****3 0 0 3****AIM:**

To introduce to the students the various functions of materials management and logistics

**OBJECTIVE:**

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

**UNIT I INTRODUCTION****6**

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

**UNIT II MANAGEMENT OF PURCHASE****7**

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

**UNIT III MANAGEMENT OF STORES AND LOGISTICS 12**

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

**UNIT IV MATERIALS PLANNING 10**

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

**UNIT V INVENTORY MANAGEMENT 10**

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

**TOTAL: 45 periods**

**BOOKS FOR REFERENCES:**

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. Gupta P.K. and Manmohan, Problems in Operations Research, Suttan Chand & Sons, 2003.
4. Dr.R. Kesavan, C.Elanchezian and B.Vijaya Ramnath, Production Planning and Control, Anuratha Publications, Chennai, 2008.
5. G. Reghuram, N. Rangaraj, Logistics and supply chain management – cases and concepts, Macmillan India Ltd., 2006.

**19254E16B FINANCIAL MANAGEMENT 3 0 0 3**

**AIM:**

To introduce the concepts of financial and various functions of financial management so that the students will be able to handle higher level financial decisions.

**OBJECTIVES:**

To train students in various functions of finance such as working capital management, current assets management so that students will be able to make high investment decisions when they take up senior managerial positions.

**UNIT – I FINANCIAL ACCOUNTING 8**

Accounting principles - Basic records - Preparation and interpretation of profit and loss statement - balance sheet - Fixed assets - Current assets.

**UNIT – II COST ACCOUNTING 12**

Elements of cost - cost classification - material cost - labour costs - overheads - cost of a product - costing systems - cost determination - process - costing - Allocation of overheads - Depreciation - methods.

**UNIT – III MANAGEMENT OF WORKING CAPITAL 10**

Current assets - Estimation of working capital requirements - Management of accounts receivable - Inventory - Cash - Inventory valuation methods



## **UNIT – IV CAPITAL BUDGETING**

**8**

Significance of capital budgeting - payback period - present value method – accounting rate of return method - Internal rate of return method.

## **UNIT – V PROFIT PLANNING AND ANALYSIS**

**7**

Cost - Volume profit relationship relevant costs in decision making profit management analysis - Break even analysis.

**TOTAL: 45 PERIODS**

### **BOOKS FOR REFERENCES:**

1. Prasanna Chandra, Financial Management, Tata McGraw Hill, 1998.
2. G.B.S. Narang, Production and Costing, Khanna Publishers, 1993.
3. R. Kesavan, C.Elanchezian, Sundar Selwyn, Engineering Economics and Financial Accounting, Laxmi Publications, New Delhi, 2005.
4. R Kesavan, C. Elanchezian, B.Vijaramnath, Engineering Economics and Cost Analysis Anuratha Publications, Chennai.

## **19254E16C MANUFACTURING INFORMATION SYSTEMS 3 0 0 3**

### **AIM:**

To impart the knowledge in manufacturing information system.

### **OBJECTIVE:**

On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

## **UNIT I INTRODUCTION**

**5**

The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

## **UNIT II DATABASE**

**7**

Terminologies – Entities and attributes – Data models, schema and subschema - Data Independence – ER Diagram – Trends in database.

## **UNIT III DESIGNING DATABASE**

**13**

Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query.

## **UNIT IV MANUFACTURING CONSIDERATION**

**10**

The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the stock status database – the complete IOM database.

## **UNIT V INFORMATION SYSTEM FOR MANUFACTURING**

**10**

Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems; Computer based production management system, computerized manufacturing information system – case study.

**TOTAL: 45 PERIODS**

**BOOKS FOR REFERENCES:**

1. Luca G.Sartori, "Manufacturing Information Systems", Addison-Wesley Publishing Company, 1988.
2. Date.C.J., "An Introduction to Database Systems" Addison Wesley, 8th Edn,.2003
3. Orlicky.G., "Material Requirements Planning", McGraw-Hill, 1994.
4. Kerr.R, "Knowledge based Manufacturing Management", Addison-Wesley,1991.
5. Manufacturing Information & Data Systems Analysis, Design & Practice,CECELJA FRANJO, 2002.

**List of Electives - Elective II**

**19254E24A      FINITE ELEMENT APPLICATIONS IN MANUFACTURING      3 0 0 3**

**AIM:**

To impart knowledge in the area of finite element methods and its application in manufacturing.

**OBJECTIVE:**

To study the fundamentals of one dimensional and two dimensional problems using FEA in manufacturing.

**UNIT I INTRODUCTION**

**6**

Fundamentals – Initial, boundary and eigen value problems – weighted residual, Galerkin and Raleigh Ritz methods - Integration by parts – Basics of variational formulation – Polynomial and Nodal approximation.

**UNIT II ONE DIMENSIONAL ANALYSIS**

**10**

Steps in FEM – Discretization. Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

**UNIT III SHAPE FUNCTIONS AND HIGHER ORDER FORMULATIONS 10**

Shape functions for one and two dimensional elements- Three noded triangular and four noded quadrilateral element Global and natural co-ordinates—Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

**UNIT IV COMPUTER IMPLEMENTATION**

**9**

Pre Processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages – Development of code for one dimensional analysis and validation.

**UNIT V ANALYSIS OF PRODUCTION PROCESSES****10**

FE analysis of metal casting – special considerations, latent heat incorporation, gap element – Time stepping procedures – Crank – Nicholson algorithm – Prediction of grain structure – Basic concepts of plasticity and fracture – Solid and flow formulation – small incremental deformation formulation – Fracture criteria – FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency – FE analysis of welding.

**TOTAL: 45 PERIODS****BOOKS FOR REFERENCES:**

1. Reddy, J.N. An Introduction to the Finite Element Method, McGraw Hill, 1985.
2. Rao, S.S., Finite Element method in engineering, Pergammon press, 1989.
3. Lewis R.W.Morgan, K, Thomas, H.R. and Seetharaman, K.N. The Finite Element Method in Heat Transfer Analysis, John Wiley, 1994.

**19254E24B****LEAN MANUFACTURING****3 0 0 3****AIM:**

To introduce the concepts of lean manufacturing system.

**OBJECTIVES:**

- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.

**UNIT – I INTRODUCTION TO LEAN MANUFACTURING****7**

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

**UNIT – II CELLULAR MANUFACTURING, JIT, TPM****9**

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

**UNIT – III SET UP TIME REDUCTION, TQM, 5S, VSM****10**

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

**UNIT – IV SIX SIGMA****9**

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

**UNIT – V CASE STUDIES****10**

Various case studies of implementation of lean manufacturing at industries.

**TOTAL: 45 PERIODS****BOOKS FOR REFERENCES:**

1. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003
2. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’ , Lean Enterprise Institute, Brookline, MA.
4. Mikell P. Groover (2002) ‘Automation, Production Systems and CIM.

**19254E24C****DESIGN AND ANALYSIS OF EXPERIMENTS****3 0 0 3****1. INTRODUCTION**

Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsoring agent’s requirements, Ethical, Training, Cooperation and Legal aspects.

**2. RESEARCH DESIGN****10**

Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques ,Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research. Research Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brain storming and Delphi Method.

**3. RESEARCH MODELING****10**

Mathematical – Classification of Models, Development of Models, Stages in Model building, Principles of Modeling, Use of Analogy, Models as Approximations, Data consideration and Testing of Models (b) Heuristics and Simulation – Definition, Applications and reasons for using Heuristics, Heuristic Methods and approaches, Meta-Heuristics; Simulation – Meaning, Applications and Classification of Simulation Models, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.

**4. EXPERIMENTATION****8**

Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments.

**5. PROCESS OPTIMIZATION AND ANALYSIS****10**

240

Factorial Design principles, Two factor Factorial Design, General Factorial Design, Fitting response Curves and Surfaces, Blocking, Taguchi Approach to Parameter Design, Robust Design. Analysis of Variance and Co-variance, Hypothesis Testing – Parametric. Report Writing: Pre-writing Considerations, Principles of Thesis Writing, Format of Report Writing, Format of Publication in Research Journals

#### **REFERENCES FOR BOOKS:**

1. Krishnaswamy, K.N., Sivakumar, Appa Iyer & Mathirajan M., (2006) -Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, 5/e. (New York, John Wiley & Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, 2/e. (New Delhi, New Age International Ltd. Publishers)
4. Ross, Phillip J. (1996) – Taguchi Techniques for Quality Engineering, 2/e. (New York, McGraw Hill)
5. Rao S. S. (2004 ) – Engineering Optimization Theory & Practices, 3/e (New Delhi, New Age International Ltd., Publishers)

### **List of Electives - Elective III**

**19254E25A    ADVANCED METROLOGY AND COMPUTER AIDED INSPECTION    3 0 0 3**

#### **AIM:**

To give a thorough knowledge of measurement and instrumentation of increasing importance in industry. The student will be knowledgeable in various standards and proliferation of computerized and automated inspecting techniques along with the classical metrology.

#### **OBJECTIVES:**

- To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries.
- Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

**UNIT I GENERAL CONCEPTS OF MEASUREMENT    8**

Definition – Standards of measurement – Errors in measurement – Interchangeability and Selective assembly – Accuracy and Precision – Calibration of instruments.

## UNIT II MEASUREMENT OF SURFACE FINISH AND MEASURING MACHINES

9

Definitions – Types of Surface Texture: Surface Roughness Measurement Methods- Comparison, Profilometer, 3D Surface Roughness Measurement – Instruments.

### UNIT III INTERFEROMETRY 8

Interferometry – Introduction, Principles of light interference – Interferometers – Measurement and Calibration – Laser Interferometry.

### UNIT IV COMPUTER AIDED AND LASER METROLOGY 10

Tool Makers Microscope – Microhite – Co – Ordinate measuring machine – Applications – Laser Micrometer, Laser Scanning gauge, Non contact and in-process inspection, Vision system.

### UNIT V IMAGE PROCESSING 10

Overview, Computer imaging systems, Image Analysis, Preprocessing, Human vision system, Image model, Image enhancement, gray scale models, histogram models, Image Transforms.

**TOTAL: 45 PERIODS**

### BOOKS FOR REFERENCES:

1. GUPTA, I.C, “A Text Book of engineering metrology”, Dhanpat Rai and Sons, 1996.
2. G.N.GALYER F.W. and C.R.SHOTBOLT, “Metrology for engineers”, ELBS, 1990.
3. GRAHAM T.SMITH, “Industrial Metrology”, Springer, 2002
4. “ASTE Handbook of Industries Metrology”, Prentice Hall of India Ltd., 1992.
5. R.K.RAJPUT, “Engineering Metrology and Instrumentations”, Kataria & Sons Publishers, 2001.
6. MILAN SONKA, VACLAV HLAVAC and ROGER BOYLE, “Image Processing, Analysis, and Machine Vision”, Cengage-Engineering; 3 edition (March 19, 2007).

### 19254E25B MAINTENANCE MANAGEMENT 3 0 0 3

#### OBJECTIVE:

To understand the concepts of maintenance management and to have knowledge in developing a suitable maintenance system for any type of an organization.

#### UNIT I: Introduction to Maintenance Management: 7

Maintenance: Its role and scope in total Organizational contexts - role of Maintenance. Centralized and decentralized maintenance organization structures. Maintenance Economics – reliability and Availability – MTBF, MTTR.

#### UNIT II: Maintenance Categories: 10

Maintenance system– Categories - Design and its selection – Breakdown Maintenance –Routine Maintenance- Predictive Maintenance –Preventive Maintenance- Corrective Maintenance-Total Productive Maintenance –Maintenance Schedule – Repair Cycle.

**UNIT III: Spare Parts Management: 8**

Pareto’s principles for repetitive breakdown analysis, spares management, planning considerations for each type of activities.

**UNIT – IV: Condition Monitoring: 10**

Condition Monitoring (CM) – Introduction- Economics of CM – On-load and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

**UNIT V: Maintenance Manpower Cost, Performance Management: 10**

Maintenance man power planning - Selection training - Scheduling maintenance costs - Budget preparation and budgetary control of maintenance expenditures Maintenance effectiveness various performance indices - evaluation, uses and limitations - Monitoring of Maintenance performance.

**TEXT BOOKS FOR REFERENCES:**

1. Gopalakrishnan P. and Sundarajan 1996. Maintenance Management. New Delhi, Prentice-Hall of India.
  2. Srivastava S.K., “Industrial Maintenance Management”, - S. Chand & Co.,1981.
  3. Higgirs L.T and Morrow L.C., 1997, ``Maintenance Engineering Handbook``, McGraw Hill.
- Armstrong, “Condition Monitoring”, BSIRSA, 1988.

**19254E25C OPTIMIZATION TECHNIQUES 3 0 0 3**

**UNIT I - INTRODUCTION TO OPTIMIZATION 7**

Formulation of an optimization problem- Classification of optimization problem – optimization techniques- Classical optimization technique – Single variable optimization – Multi variable optimization algorithms

**UNIT II - MINIMIZATION METHODS 8**

One dimensional minimization methods: unimodal function – elimination methods: unrestricted search, exhaustive search, Dichotomous search, Fibonacci methods, Golden section methods, Interpolation methods: Quadratic and cubic interpolation methods.

**UNIT III - CONSTRAINED OPTIMIZATION TECHNIQUES 10**

Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions, Lagrange multipliers - separable programming and Geometric programming.

**UNIT IV - UNCONSTRAINED OPTIMIZATION TECHNIQUES 10**

Multi variable unconstrained optimization techniques: Direct search methods: Random search method, unvaried method, pattern search method, steepest descent method and Conjugate gradient method.

**UNIT V - APPLICATIONS OF HEURISTICS IN OPTIMIZATION 10**

**BOOKS FOR REFERENCES:**

1. Rao, Singaresu, S., “Engineering Optimization – Theory & Practice”, New Age International (P) Limited, New Delhi, 2000.
2. Johnson Ray, C., “Optimum design of mechanical elements”, Wiley, John & Sons, 1990.
3. Kalyanamoy Deb, “Optimization for Engineering design algorithms and Examples”, Prentice Hall of India Pvt. 1995.
4. Goldberg, D.E., “Genetic algorithms in search, optimization and machine”, Barnen, Addison-Wesley, New York, 1989.

**List of Electives - Elective IV**

**19254E32A                      MANUFACTURING SYSTEMS AND SIMULATION                      3 0 0 3**

**AIM:**

To introduce the various concepts of manufacturing system simulation.

**OBJECTIVES:**

- To model manufacturing systems of different kinds.
- To make use of simulation languages for manufacturing systems.

**UNIT I INTRODUCTION**

**8**

Basic concepts of system – elements of manufacturing system - concept of simulation – simulation as a decision making tool – types of simulation – Monte-Carlo simulation - system modeling – types of modeling – Limitations and Areas of application of simulation.

**UNIT II RANDOM NUMBERS**

**10**

Probability and statistical concepts of simulation – Pseudo random numbers – methods of generating random numbers – discrete and continuous distribution – testing of random numbers – kolmogorov-mirnov test, the Chi-Square test - sampling - simple, random and simulated.

**UNIT III DESIGN OF SIMULATION EXPERIMENTS**

**10**

Problem formulation – data collection and reduction – time flow mechanical – key variables - logic flow chart starting condition – run size – experimental design consideration – output analysis, interpretation and validation – application of simulation in engineering industry.

**UNIT IV SIMULATION LANGUAGE**

**9**

Comparison and selection of simulation languages - Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.



## UNIT V CASE STUDIES

10

Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems – case studies.

**TOTAL: 45 PERIODS**

### BOOKS FOR REFERENCES:

1. Jerry Banks and John S. Carson, “Discrete event system simulation”, Prentice Hall 1991
2. 1 .John H. Mize and J. Grady Cox, “Essentials of simulation” – Prentice hall 1989.
3. Geoffrey Gordon “System simulation” – Prentice Hall of India, 1992
4. Jeffrey L. Written, Lonnie D, Bentley and V.M. Barice, “System analysis and Design Methods”, Galgotia publication, 1995
5. Averill M. Law and W. David Kelton, “Simulation Modeling and analysis”, McGraw Hill International Editions, 1991
6. Shannon R.E., “System simulation”, Prentice Hall 1993.

**19254E32B**

## **INSTRUMENTATION AND CONTROL ENGINEERING**

**3 0 0 3**

### **UNIT–I: Introduction to Instrumentation:**

**8**

Mechanical Instrumentation- General concepts, General measurement system. Classification of Instruments - indicators, recorders and integrators- working principles, Precision and Accuracy: Measurement Error and calibration.

### **UNIT–II: Measuring Devices**

**10**

Measurement of speed, frequency, acceleration - Vibrometer, Accelerometer etc. Pressure measurement: Gravitational, Bourdon, elastic transducers, strain gauge, pressure cells, and measurement of high and low pressure. Temperature measurement: Bi-Metallic, Resistance Thermometer, Thermocouples, Pyrometer, thermostats, Magnetic flow meter , Ultrasonic flow meter.

### **UNIT – III: Transducers:**

**8**

Transducers – Introduction – Types -Variable resistance Transducers-Variable reactive transducers- Piezo Electric transducers- Fibre optic transducers- Laser instrumentation-analogue and digital type -incremental and absolute measurement.

### **UNIT – IV: Machine Diagnostic and Condition Monitoring:**

**10**

Machine Diagnostics – Basic Concepts - Analysis of failure in machines-Distribution of fault occurrences-Objectives of monitoring-Monitoring techniques applied to Machineries.

### **UNIT – V: Computer Control System:**

**9**

Data acquisition system-Introduction-Direct Digital control-Programmable Logic Controls (PLC) -Ladder diagrams-Communication used in PLC.

### BOOKS FOR REFERENCES:

1. Thomas Beckwith, Lewis Buck N. Ray, D. Maragoni, “Mechanical Measurements”, Narosia Publishing House, New Delhi.

2. M.P.Groover - " Automation, Production Systems and computer Intergrated Manufacturing ", Prentice Hall.
3. A.K. Sawhney, "Electrical and Electronics Measurements & Instrumentation", Dhanpat Rai & Sons, 1993
4. C.S.Rangan,V.S.V.Mani and G.R.Sarma - " Instrumentation Devices and systems", Tata McGraw Hill,1983

**19254E32C      ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS      3 0 0 3**

**UNIT – I - Neural Networks      8**

Introduction to soft Computing-Neural Networks-Supervised Learning Neural Networks – Perceptrons – Adaline – Back propagation Multilayer perceptrons – Radial Basic Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Habbian Learning.

**UNIT – II - Fuzzy Logic:      10**

Fuzzy Sets – Basic Definition and Terminology – Set –theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning. Fuzzy Logic: 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 – III Genetic Algorithm:      9**

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 – IV Neuro Fuzzy Modeling:      10**

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 Applications:      8**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction – Single MLP approaches –CANFIS modeling for color recipe prediction

**BOOKS FOR REFERENCES:**

1. Jang, J.S.R., C.T. Sun and E. Mizutani., “Neuro – Fuzzy and Soft Computing”, PHI, Person Education, 2004.

2. Eberhart, R., Simpson, P. and Dobbins, R., “Computational Intelligence PC Tools”, AP Professional, Boston 1996.
3. Goldberg, Davis E., “Optimization and Machine Learning” Addison Wesley, New York, 1989.
4. S. Rajasekaran and Pai, G.A.V., “Neural Networks, Fuzzy Logic and Genetic Algorithms”, Prentice Hall of India, New Delhi, 2003.

### List of Electives - Elective V

<b>19254E33A</b>	<b>PRODUCT DESIGN AND DEVELOPMENT</b>	<b>3 0 0 3</b>
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<b>UNIT I - INTRODUCTION</b>	<b>7</b>
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Significance of product design, product design and development process, sequential engineering design method, the challenges of product development.

<b>UNIT II - PRODUCT PLANNING AND PROJECT SELECTION</b>	<b>8</b>
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Identifying opportunities evaluate and prioritize projects, allocation of resources  
Identifying Customer Needs, Interpret raw data in terms of customers need, organize needs in hierarchy and establish the relative importance of needs.

<b>UNIT III - PRODUCT SPECIFICATIONS</b>	<b>8</b>
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Establish target specifications, setting final specifications, Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally.

<b>UNIT IV - INDUSTRIAL DESIGN AND CONCEPT SELECTION</b>	<b>10</b>
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Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, Overview, concept screening and concept scoring, methods of selection.

<b>UNIT V - THEORY OF INVENTIVE PROBLEM SOLVING (TRIZ) AND CONCEPT TESTING</b>	<b>12</b>
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Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model-based technology for generating innovative ideas Elements of testing: qualitative and quantitative methods including survey, measurement of customers' response, Intellectual Property: Elements and outline, patenting procedures.

## BOOKS FOR REFERENCES:

1. Ulrich K. T, and Eppinger S.D, Product Design and Development, Tata McGraw Hill
2. Otto K, and Wood K, Product Design, Pearson
3. Engineering of creativity: introduction to TRIZ methodology of inventive Problem Solving, By Semyon D. Savransky, CRC Press.
4. Inventive thinking through TRIZ: a practical guide, By Michael A. Orloff, Springer.
5. Systematic innovation: an introduction to TRIZ ; (theory of inventive Problem Solving), By John Terninko, Alla Zusman, CRC Press.

19254E33B

### FLUID POWER AUTOMATION

3 0 0 3

#### AIM:

To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

#### OBJECTIVE:

- To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.
- To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

#### UNIT I INTRODUCTION

5

Need for Automation, Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.

#### UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS

8

Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators – standard circuit symbols, circuit (flow) analysis.

#### UNIT III CONTROL AND REGULATION ELEMENTS

8

Direction flow and pressure control valves-Methods of actuation, types, sizing of ports pressure and temperature compensation, overlapped and under lapped spool valves operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

#### UNIT IV CIRCUIT DESIGN

10

Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.

#### UNIT V ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS

7

Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

**TOTAL: 45 PERIODS**

#### BOOKS FOR REFERENCES:

1. Antony Esposito, Fluid Power Systems and control Prentice-Hall, 1988.

2. Peter Rohner, Fluid Power logic circuit design. The Macmillan Press Ltd., London, 1979
3. E.C.Fitch and J.B.Suryaatmady. Introduction to fluid logic, McGraw Hill, 1978.
4. W.Bolton, Mechatronics, Electronic control systems in Mechanical and Electrical Engineering Pearson Education, 2003.
5. Peter Rohner, Fluid Power Logic Circuit Design, Mcmelan Prem, 1994.

### List of Electives - Elective VI

**19254E34A    ADVANCED MATERIAL TECHNOLOGY    3 0 0 3**

**AIM:**

To impart knowledge on advance concepts of material technology

**OBJECTIVE:**

- To enlight the PG students on elastic, plastic and fractured behaviour of engineering Materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

**UNIT I ELASTIC AND PLASTIC BEHAVIOR    10**

Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

**UNIT II FRACTURE BEHAVIOUR    10**

Griffith's theory, stress intensity factor and fracture toughness – Toughening mechanisms – Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law. Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

**UNIT III SELECTION OF MATERIALS    10**

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

**UNIT IV MODERN METALLIC MATERIALS    8**

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nano crystalline materials.

**UNIT V NON METALLIC MATERIALS    249    7**

Polymeric materials – Formation of polymer structure – Production techniques of fibers, foams, adhesives and coating – structure, properties and applications of engineering polymers – Advanced structural ceramics, WC, TiC, TaC, Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub> CBN and diamond – properties, processing and applications.

**TOTAL: 45 PERIODS**

**BOOKS FOR REFERENCES:**

1. George E. Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
2. Thomas H. Courtney, Mechanical Behaviour of Materials, (2nd edition), McGraw Hill, 2000.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4<sup>th</sup> Edition) Jaico, 1999.
4. ASM Hand book, Vol.11, Failure Analysis and Prevention, (10th Edition), ASM, 2002.
5. Ashby M.F., Material Selection in Mechanical Design, 3rd Edition, Butter Worth 2005.

## M.Tech. – Manufacturing Technology PART TIME PROGRAMME Regulation 2019

### SEMESTER-I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19248S11EP	Advanced Engineering Mathematics	3	1	-	4
19254C12P	Theory of Metal Cutting	3	1	-	4
19254C13P	Advanced Manufacturing Processes	3	1	-	4
19254L14P	CIM Lab	-	-	3	3
19254CRSP	Research Led Seminar	0	-	-	1
<b>TOTAL NO. OF CREDITS</b>					<b>16</b>

### SEMESTER-II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254C21P	Production Management	3	1	-	4
19254C22P	MEMS and Nano Technology	4	-	-	4

19254E23_P	Elective - I	4	-	-	3
19254L24P	Automation Lab	-	-	3	3
192TECWRP	Technical Writing/Seminars	-	-	3	3
19254CRMP	Research Methodology	4	-	-	3
19254CBRP	Participation in Bounded Research	0	-	-	2
<b>TOTAL NO. OF CREDITS</b>					<b>22</b>

### SEMESTER-III

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254C31P	Mechanical Metallurgy	3	1	-	4
19254C32P	Automated Computer Integrated Manufacturing Systems	3	1	-	4
19254E33_P	Elective II	4	-	-	3
19254CSRP	Design /Socio Technical Project	-	-	6	6
<b>TOTAL NO. OF CREDITS</b>					<b>17</b>

### SEMESTER-IV

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254C41P	Manufacturing Metrology and Quality Control	4	-	-	4
19254C42P	Metal Forming Process	4	-	-	4
19254E43_p	Elective III	4	-	-	3
19254P44P	Project Work Phase - I	-	-	10	10
<b>TOTAL NO. OF CREDITS</b>					<b>21</b>

### SEMESTER-V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E51_P	Elective IV	4	-	-	3
19254E52_P	Elective V	4	-	-	3
19254E53_P	Elective VI	4	-	-	3
<b>TOTAL NO. OF CREDITS</b>					<b>9</b>

#### SEMESTER-VI

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254P61P	Project Work Phase - II	-	-	15	15
<b>TOTAL NO. OF CREDITS</b>					<b>15</b>



**ELECTIVE-I**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E23AP	Finite Element Application in Manufacturing	4	-	-	3
19254E23BP	Lean Manufacturing	4	-	-	3
19254E23CP	Design and Analysis of Experiments	4	-	-	3

**ELECTIVE-II**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E33AP	Materials Management and Logistics	4	-	-	3
19254E33BP	Financial Management	4	-	-	3
19254E33CP	Manufacturing Information Systems	4	-	-	3

**ELECTIVE-III**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E43AP	Advanced Metrology and Computer Aided Inspection	4	-	-	3
19254E43BP	Maintenance Management	4	-	-	3
19254E43CP	Optimization Techniques	3	1	-	3

**ELECTIVE-IV**

253

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E51AP	Manufacturing Systems and Simulation	4	-	-	3
19254E51BP	Instrumentation and Control Engineering	4	-	-	3
19254E51CP	Artificial Intelligence and Neural Networks	3	1	-	3

**ELECTIVE-V**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E52AP	Product Design and Development	4	-	-	3
19254E52BP	Fluid Power Automation	4	-	-	3

**ELECTIVE-VI**

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
19254E53AP	Advanced Material Technology	4	-	-	3
19254E53BP	Industrial Ergonomics	4	-	-	3

**DEPARTMENT OF MECHANICAL ENGINEERING**

**M.TECH., MANUFACTURING TECHNOLOGY - PART TIME PROGRAMME  
SYLLABUS-REGULATIONS- 2019**

## I - SEMESTER

**19248S11EP    ADVANCED ENGINEERING MATHEMATICS    3 1 0 4**

### **LAPLACE TRANSFORM:**

Laplace transform methods for one-dimensional wave equation – Displacement in a long string – longitudinal vibration of an elastic bar – Laplace equation – properties of harmonic functions.

### **FOURIER TRANSFORM**

Fourier transforms methods for one – dimensional heat conduction problems in infinite and semi infinite rod – Fourier transform methods for Laplace equation.

### **PROBABILITY OF DISTRIBUTION**

Probability – definition and introduction – random variable – probability density functions – study of standard distributions: Binomial, poisson, normal exponential and weibull distributions – Applications – Baye's theorem.

### **TESTING OF HYPOTHESIS**

Testing of Hypothesis – Parametric test – Small samples – Test related proportion, Means, Standard deviation – Test based on chi-square, Goodness of fit and test of independence.

### **THEORY OF ESTIMATION**

Principles of least squares – Multiple and partial correlation and regression – Estimation of parameters – Method of moments.

### **BOOKS FOR REFERENCE:**

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and Lliberman
4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999

**19254H12P    THEORY OF METAL CUTTING    3 1 0 4**

### **OBJECTIVE:**

To know about the mechanics of chip formation, to analyse the tool failure, and thermodynamics involved in metal cutting and evaluation of tool materials.

### **UNIT- I: Orthogonal Cutting:**

Orthogonal Cutting – Theories of merchant – Lee and Shaffer – Merchant's circle diagram – shear angle relationship – chip velocity – force – velocity relationships

### **UNIT-II: Chip Formation:**

255

Mechanism of chip formation – Types of Chips – discontinuous, continuous continuous with BUE – Chip Formation in drilling and Milling – effect of cutting variables of chip reduction coefficient.

### **UNIT-III : Tool Life and Machinability:**

Tool Failure: Mode of Plastic failure – Measurement of tool wear – tool life tests – tool life equation for variable theories – variables affecting tool life – machinability – machinability index – problems.

### **UNIT-IV: Thermal Analysis in Metal Cutting:**

Thermodynamics of orthogonal cutting – analysis of temperature at shear plane and tool face – experimental methods for temperature measurement.

### **UNIT-V: Chatter:**

Chatter - Importance of Chatter in machining – types of chatter – avoidance of chatter. Tools materials – requirements – alloy tools - HSS – carbides –PCD and CBN- properties and application.

### **BOOKS FOR REFERENCE:**

1. Juneja .B.L, “Fundamentals of Metal cutting and Machine tools”, New Age International, 1995.
  2. Bhattacharya.A, “Metal Cutting Theory and Practice”, Central book publications
  3. Kuppusamy .G, “Principle of Metal Cutting”, University Press, 1996.
  4. Shaw .M.C, “Metal Cutting Principles”, I BH Publications, 1992.
- Armarego E.J.A and Brown R.H, “The Machining of Metals”, Prentice Hall, 1969

19254H13P

**ADVANCED MANUFACTURING PROCESSES**

**4 0 0**

4

### **AIM:**

To expose the students in the art of manufacturing new products due to the development of new materials and processes. The students will totally get a feel of the relevant suitable process while evaluating and deciding.

### **OBJECTIVE:**

- To inform the students about the various alternative manufacturing processes available.
- To develop an altitude to look for the unconventional manufacturing process to machine
- To make them to understand and appreciate the latest manufacturing process for micro fabrication and devices.

### **UNIT I NEWER MACHINING PROCESSES - I 9**

(Non thermal energy) – Abrasive machining – water jet machining - ultrasonic machining – chemical machining – electro chemical machining – construction working principle – steps - types – process parameters – derivations – problems, merits, demerits and applications .

### **UNIT II NEWER MACHINING PROCESS – II 9**

Wire cut EDM - Electro chemical machining – ECG - Electric discharge machining – construction – principle – types – control - circuits – tool design – merits, demerits & applications.

250

### **UNIT III NEWER MACHINING PROCESS – III 9**

Laser beam machining – Electron beam machining – Plasma arc machining – Ion beam machining – construction working principle types – process parameter – derivations – problems, merits, demerits and applications.

### **UNIT IV FABRICATION OF MICRO DEVICES 9**

Semiconductors – films and film depurification – Oxidation - diffusion – ion implantation – etching – metallization – bonding – surface and bulk machining – LIGA Process – Solid free form fabrication.

### **UNIT V MICROFABRICATION TECHNOLOGY 9**

Wafer preparation – monolithic processing – moulding – PCB board hybrid & mcm technology – programmable devices & ASIC – electronic material and processing.– sterolithography SAW devices, Surface Mount Technology,

**TOTAL: 45 PERIODS**

#### **BOOKS FOR REFERENCE:**

1. Serope kelpkijian & stevan r. schmid- manufacturing process engg material – 2003
2. Micro sensors Mems & smart devices- Julian W.Hardner – 2002
3. Brahem T. Smith, Advanced machining I.F.S. UK 1989.
4. Jaeger R.C., Introduction to microelectronic fabrication Addison Wesley, 1988.
5. Nario Taniguchi – Nano technology – Oxford University Press 1996.
6. Pandey P.C. & Shan HS Modern Machining Processes, Standard Publishing Co., 1980
7. More Madon, Fundamentals of Microfabrication, CRC Press, 1997.

**19254L14P**

**CIM LAB**

**0 0 3 3**

#### **AIM:**

To impart the knowledge on training the students in the area of CAD/CAM.

#### **OBJECTIVES:**

To teach the students about the drafting of 3D components and analyzing the same using various CAD/CAM software's.

#### **CAM LABORATORY**

1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving & canned cycle
2. Exercise on CNC Milling Machine: Profile Milling, Mirroring, Scaling & canned cycle.
3. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.
4. Mini project on any one of the CIM elements is to be done. This can be either a software or hardware simulating a CIM element. At the end of the semester, the students has to submit a mini report and present his work before a Committee.

#### **CAD LABORATORY**

2D modeling and 3D modeling of components such as

1. Bearing
2. Couplings
3. Gears
4. Sheet metal components
5. Jigs, Fixtures and Die assemblies.

257

**TOTAL: 30 PERIODS.**

**SEMESTER II**

**19254H21P PRODUCTION MANAGEMENT 3 1 0 4**

**OBJECTIVE:**

To gain knowledge in operation management principles and the related quantitative approaches.

**UNIT-I : Manufacturing System:**

The concept of system - types of manufacturing system- the concept of a model - model classification - model building - decision making approaches. Forecasting: qualitative and quantitative methods - moving averages- single and multiple regression models.

**UNIT-II : Aggregate Planning :**

Methods of aggregate planning- graphical and charting methods, trial and error, transportation method- concepts of linear decision rule.

**UNIT-III: Inventory Management Systems and Models**

EOQ, model (without and with shortages)- inventory models allowing price breaks, EPQ model - single period inventory model - inventory control systems - P,Q and S-s system - selective inventory control techniques.

**UNIT-IV: MRP & JIT:**

Materials requirement planning (MRP) - master production schedule, bill of materials, MRP concepts, lot sizing - lot-for-lot technique, EOQ approach, silver-meal approach, period order quantity approach, least unit cost approach, least total cost approach.

Principles of JIT production pull and push system, kanban, JIT purchasing, supply chain management.

**UNIT-V: Scheduling:**

Scheduling and assignment problems - notation and definitions - criteria, objective functions for scheduling - job shop scheduling: sequencing of n jobs through 1 machine - priority rules, n jobs through 3, m machines - Johnsons rule, CDS algorithm, 2 jobs on m machine - graphical method- multi product assignment problem - index method, Hungarian method.

**BOOKS FOR REFERENCE:**

3. Production Operation Management: Theory And Problems, Chary: S.N, TMH, New delhi, 1990.
4. Production Operation Management, Pannerselvam.R, PHI, 1999.
5. Operation Management Theory And Problems, Monks.J.G., McGraw HILL, 1987.
6. Production operation management, chase.R.B., Aquiliano.N.J and Jacobs.R.R., 8<sup>th</sup> Edition, TMH, 1988.
7. Production Planning And Inventory Control, Narashimhan. S.L., Mcleavy.D.W., and Billington.P.J., 2<sup>nd</sup> Edition., PHI, 1997

**SEMESTER II****19254H22P****MEMS AND NANO****TECHNOLOGY 4 0 0 4****AIM:**

To inspire the students to expect to the trends in manufacturing micro components and measuring systems to nano scale.

**OBJECTIVES:**

- To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be aware of micro actuators.
- Also to impart knowledge to the students about nano materials and various nano measurements techniques.

**UNIT I OVER VIEW OF MEMS AND MICROSYSTEMS****6**

Definition – historical development – fundamentals – properties, micro fluidics, design and fabrication micro-system, microelectronics, working principle and applications of micro system.

**UNIT II MATERIALS, FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING****10**

Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds silicon piezo resistors, Gallium arsenide, quartz, polymers for MEMS, conductive polymers. Photolithography, photo resist applications, light sources, in implantation, diffusion process exudation – thermal oxidation, silicon diode, chemical vapour deposition, sputtering - deposition by epitaxy – etching – bulk and surface machining – LIGA process Micro system packaging – considerations packaging – levels of micro system packaging die level, device level and system level.

**UNIT III MICRO DEVICES AND MATERIALS****8**

Sensors – classification – signal conversion ideal characterization of sensors micro actuators, mechanical sensors – measurands displacement sensors, pressure and flow sensors, micro actuators –

smart materials – applications.

#### **UNIT IV SCIENCE OF NANO MATERIALS**

**10**

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.

#### **UNIT V CHARACTERIZATION OF NANO MATERIALS**

**11**

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

**TOTAL: 45 PERIODS**

#### **BOOKS FOR REFERENCE:**

1. Tai – Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.
2. Mark Madou Fundamentals of Microfabrication, CRC Press, New York, 1997.
3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003
4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.
5. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003
6. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

**19254L24P**

**AUTOMATION LAB**

**0 0 3 3**

#### **AIM:**

To impart knowledge in the area of hydraulic and pneumatic components and its functions.

#### **OBJECTIVE:**

- To make the students to learn the basic concepts of hydraulics and pneumatics and its applications in the area of manufacturing process.
- To simulate the various hydraulics and pneumatics circuits.

#### **EXPERIMENTS:**

1. Simulation of single and double acting cylinder circuits
2. Simulation of Hydraulic circuits
3. Simulation of electro pneumatic circuits
4. Simulation of electro hydraulic circuits
5. Simulation of PLC circuits
6. Exercises on linear and angular measurements
7. Exercises on speed measurements
8. Exercises on Vibration measurements
9. Exercises on Motion controller using servo motors, encoders, etc.
10. Exercises on fiber optics transducers.
11. Exercises on stepper motor.
12. Exercises on microprocessor based data acquisition system.
13. Software simulation of fluid power circuits using Automation studio.

260

**TOTAL : 30 PERIODS**



## **192TECWRP      Technical Writing/Seminar: 0 0 3 3**

Seminar should be based on the literature survey on any topic relevant to CAD/CAM/CAE. It may be leading to selection of a suitable topic of dissertation. The report shall contain some contribution by the candidate in the form of experimental results, deductions, compilation and inferences etc.

- Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department.
- The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar.

### **19254CRMP      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 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.      261

## **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 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.

### SEMESTER III

**19254H31P      MECHANICAL METALLURGY      3 1 0 4**

**OBJECTIVE:**

To study about the behaviour of Metals during the loading conditions related to distribution of Stress and Strain. To know about the fracture of metals and various test procedures.

**UNIT-I: Tensile Study:**

Study of Engineering stress-strain curve: Derivation of tensile strength , yield strength ductility, Young’s modulus, resilience and toughness from stress strain curves, study of stress-strain curves for different materials-true stress-strain curve: true stress at ultimate load, true fracture strain, true uniform strain, true necking strain-necking factor-effect of strain rate, temperature- test of flow properties-Notch tensile test-tensile properties of steel-strengthening theory- strain hardening-strain aging-Yield point phenomena-Solid solution strengthening-Martensite strengthening-Grain refinement,

**UNIT-II: Hardness and Toughness:**

Hardness and Toughness: Hardness introduction, Hardness measurement methods-Brinell hardness, Meyer hardness, Vickers hardness, Rockwell hardness and Micro hardness- Relationship between hardness and the flow curve-Hardness at higher temperatures-Toughness –introduction, Toughness measurements: Charpy, Izod and instrumented Charpy-TTT curves: Significance, metallurgical factors affecting the curves, Drop weight test, explosion crack starter test.

**UNIT-III: Fatigue:**

Fatigue study: Introduction: Different stress cycles, S-N curves, Goodman diagram, Soderberg diagram, Gerbar diagram-Cyclic stress curve-Low cycle fatigue- Strain life equation-Fatigue mechanism-High cycle fatigue-Effect of following parameters on fatigue: Mean stress , stress concentration, specimen size, surface roughness, residual stress, micro structure and temperature. Fatigue crack propagation.

**UNIT-IV: Fracture Behaviour:**

Fracture – Introduction –Types – Ductile and Brittle Cohesive Strength of Metals-Griffith Theory-Metallographic Examination of Fracture – Fractography – Notch Effect – Concept of Fracture curve – Fracture under combined stresses- Environment sensitive fracture: Hydrogen Embrittlement and Corrosion Cracking

**UNIT-V: Creep:**

Creep: Creep Curve – Stress rupture test- Structural changes during creep- Creep deformation- Deformation Mechanisms Maps – Activation Energy for Steady state creep – Fracture at higher temperatures.

**TEXT BOOKS:**

1. George E. Dieter, “Mechanical Metallurgy”, Mc Graw Hill, NewYork, 1988.
2. M.A. Meyers and K.Chawla, “Mechanical Metallurgy”, PHI.

### **BOOKS FOR REFERENCE:**

1. Metals Hand Book, "Mechanical Testing", Vol. 8, 9<sup>th</sup> Ed., ASM.
2. Thomas Courtney.H., "Mechanical Behaviour of Materials", Mc Graw hill, 2<sup>nd</sup> Ed., 2000.
3. Hertzberg R.W., "Deformation and Fracture Mechanics of Engineering Materials", 2<sup>ne</sup> Ed., John Wiley & Sons. 1983.

## **SEMESTER III**

### **19254H32P AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS 4 0 0 4**

#### **AIM:**

To stress the role of computers in production.

#### **OBJECTIVE:**

To teach the role of computers in processing the information knowing across the various Stages and various departments in a manufacturing concern.

#### **UNIT I INTRODUCTION**

**6**

Introduction to CAD, CAM, CAD/CAM and CIM - Evolution of CIM – CIM wheel and cycle – Production concepts and mathematical models – Simple problems in production models – CIM hardware and software – Major elements of CIM system – Three step process for implementation of CIM – Computers in CIM – Computer networks for manufacturing – The future automated factory – Management of CIM – Impact of CIM on personnel – CIM status.

#### **UNIT II AUTOMATED MANUFACTURING SYSTEMS**

**10**

Automated production line – system configurations, work part transfer mechanisms – Fundamentals of Automated assembly system – System configuration, Part delivery at workstations – Design for automated assembly – Overview of material handling equipments – Consideration in material handling system design – The 10 principles of Material handling. Conveyor systems – Types of conveyors – Operations and features. Automated Guided Vehicle system – Types of vehicles and AGVs applications – Vehicle guidance technology – Vehicle management and safety. Storage system performance – storage location strategies – Conventional storage methods and equipments – Automated storage/Retrieval system and Carousel storage system Deadlocks in Automated manufacturing systems – Petrinet models – Applications in Dead lock avoidance.

#### **UNIT III GROUP TECHNOLOGY AND FMS**

**10**

Part families – Visual – Parts classification and coding – Production flow analysis – Grouping of parts and Machines by rank order clustering method – Benefits of GT – Case studies. FMS – Components – workstations – FMS layout configurations – Computer control systems – FMS planning and implementation issues – Architecture of FMS – flow chart showing various operations in FMS – Machine cell design – Composite part concept, Holier method, Key machine concept – Quantitative analysis of FMS – Bottleneck model – Simple and complicated problems – Extended Bottleneck model - sizing the FMS, FMS applications, Benefits.

#### **UNIT IV PROCESS PLANNING**

**10**

Process planning – Activities in process planning, Information's required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes – selecting among casting process, forming process and machining process. Sequencing of operations according to Anteriorities – various examples – forming of Matrix of Anteriorities – case study. Typical process sheet – case studies in Manual process planning. Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning.

## **UNIT V TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE**

**9**

Introduction to process model formulation – linear feedback control systems – Optimal control – Adaptive control – Sequence control and PLC. Computer process control – Computer process interface – Interface hardware – Computer process monitoring – Direct digital control and Supervisory computer control. Overviews of Automatic identification methods – Bar code technology – Other Automatic data capture technologies.

**TOTAL: 45 PERIODS**

### **BOOKS FOR REFERENCE:**

1. Mikell P.Groover, "Automation, Production system and Computer integrated Manufacturing", Prentice Hall of India Pvt. Ltd., 2008.
2. Radhakrishnan,P., Subramanian,S., and Raju,V., "CAD/CAM/CIM" New Age International Publishers, 2000.
3. James A.Reitg, Herry W.Kraebber, "Computer Integrated Manufacturing", Pearson Education, Asia, 2001.
4. Viswanathan,N., and Narahari,Y., "Performance Modeling and Automated Manufacturing Systems", Prentice Hall of India Pvt. Ltd., 2000.
5. Alavudeen and Venkateshwaran, "Computer Integrated Manufacturing", PHI Learning Pvt. Ltd., New Delhi, 2008.

**19254H41P MANUFACTURING METROLOGY AND QUALITY CONTROL 3 1 0 4****AIM:**

To expose the students, the importance of measurement and the various latest measuring techniques using Laser, Coordinate measuring machines and Optoelectronics devices. Also to stress upon the Importance of quality in manufacturing.

**OBJECTIVES:**

To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices. Also to make the students to understand quality

**UNIT – I LASER METROLOGY 8**

Introduction – types of lasers – laser in engineering metrology – metrological laser methods for applications in machine systems – Interferometry applications – speckle interferometry – laser interferometers in manufacturing and machine tool alignment testing – calibration systems for industrial robots laser Doppler technique – laser Doppler anemometry.

**UNIT – II PRECISION INSTRUMENTS BASED ON LASER 9**

Laser telemetric systems – detection of microscopic imperfections on high quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high inertia laser scan technique – rotating mirror technique – laser gauging – bar coding – laser dimensional measurement system.

**UNIT – III CO-ORDINATE MEASURING MACHINE 10**

Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors – displacement devices – Performance Evaluations – Software – Hardware – Dynamic errors – Thermal effects diagram – temperature variations environment control – applications.

**UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 9**

Opto electronic devices – CCD – On-line and in-process monitoring in production – applications image analysis and computer vision – Image analysis techniques – spatical feature – Image extraction – segmentation – digital image processing – Vision system for measurement – Comparison laser scanning with vision system.

**UNIT – V QUALITY IN MANUFACTURING ENGINEERING 9**

Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

**TOTAL: 45 PERIODS****BOOKS FOR REFERENCE:**

1. John A. Bosch, Giddings and Lewis Dayton, Co-ordinate Measuring Machines and Systems, Marcel Dekker, Inc, 1999.
2. Juran J.M. and Gyna F.M., Quality Planning and Analysis, Tata-McGraw Hill, New Delhi
3. Zuech, Nello Understanding and Applying Machine Vision, Marcel Dekker, Inc, 2000
4. Elanchezhian.C, Vijaya Ramnath.B and Sunder Selwyn, T., Engineering Metrology, Eswar Press, Chennai, 2004.

**19254H42P METAL FORMING PROCESS 4 0 0 4**

**OBJECTIVE:** To study about the response of materials under plastic deformation and the various techniques for finding the stress for various metal working processes, and the recent developments in high speed forming.

**UNIT-I: Stress and Strain:**

Stress-State of stress in two dimensions – three dimensions – stress tensor-Mohr's circles – 2D and 3D state of stress – Description of strain at a point – Mohr's circle of strain- Hydrostatic and stress deviator component of stress- Plasticity- flow curve- true and true strain yield criteria for ductile loads combined stress test-plastic stress and strain relations- Levy Mises equations-Prandtl\_Resus equations.

**UNIT-II: Analysis of Metal Forming:**

Work Load analysis – work formula for homogeneous deformation- rolling, rod drawing and extrusion processes –Determination of load by stress evaluation method-Determination of drawing load – strip drawing with wedge shaped dies and cylindrical rod drawing with a conical die.

**UNIT-III: Stress Evaluation:**

Stress evaluation method-Determination of forging load-plane strain forging of a thin strip and a flat circular disc- Determination of extrusion load for round band flat strip- upper bound analysis – plane strain indentation with frictionless interface

**UNIT-IV: High velocity Forming:**

Study of effect of high speed on stress strain relationships- High velocity forming equipment- Description of high speed forming machine – hot forging, pneumatic-mechanical, high velocity forging – Fuel combustion process- Electro magnetic forming –Introduction- Procedure – process variables- Applications

**UNIT-V: Advanced Forming process:**

Explosive Forming – Explosives – characteristics- stand off and contact operations- stress waves and their effects- process variables – properties of formed components- applications- Electro hydraulic forming – principles, requirements and characteristics – process variables- water hammer forming- principles and parameters- governing the process.

**BOOKS FOR REFERENCE:**

1. George E.Dieter, "Mechanical Metallurgy", Mc Graw Hill International Edition, New York,1988
2. Rowe G.W,Edward , "An Introduction to the Principles of Metal Working", Edward Arnold publications.
3. Davies.R and Austin.E.R, "Developments in High Metal Forming", The Machinery Publishing Co.Ltd
4. Robert H.Wagoner and Jean Loup Chenot, "Fundamentals of Metal Forming", John Wiley and Sons Inc, New York,1992

**List of Electives - Elective I****19254E23AP - FINITE ELEMENT APPLICATIONS IN MANUFACTURING 3 10 4****AIM:**

To impart knowledge in the area of finite<sup>267</sup> element methods and its application in manufacturing.

**OBJECTIVE:**

To study the fundamentals of one dimensional and two dimensional problems using FEA in manufacturing.

**UNIT I INTRODUCTION****6**

Fundamentals – Initial, boundary and eigen value problems – weighted residual, Galerkin and Raleigh Ritz methods - Integration by parts – Basics of variational formulation – Polynomial and Nodal approximation.

**UNIT II ONE DIMENSIONAL ANALYSIS****10**

Steps in FEM – Discretization. Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

**UNIT III SHAPE FUNCTIONS AND HIGHER ORDER FORMULATIONS****10**

Shape functions for one and two dimensional elements- Three noded triangular and four noded quadrilateral element Global and natural co-ordinates—Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

**UNIT IV COMPUTER IMPLEMENTATION****9**

Pre Processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages – Development of code for one dimensional analysis and validation.

**UNIT V ANALYSIS OF PRODUCTION PROCESSES****10**

FE analysis of metal casting – special considerations, latent heat incorporation, gap element – Time stepping procedures – Crank – Nicholson algorithm – Prediction of grain structure – Basic concepts of plasticity and fracture – Solid and flow formulation – small incremental deformation formulation – Fracture criteria – FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency – FE analysis of welding.

**TOTAL: 45 PERIODS****BOOKS FOR REFERENCE:**

1. Reddy, J.N. An Introduction to the Finite Element Method, McGraw Hill, 1985.
2. Rao, S.S., Finite Element method in engineering, Pergamon press, 1989.
3. Lewis R.W.Morgan, K, Thomas, H.R. and Seetharaman, K.N. The Finite Element Method in Heat Transfer Analysis, John Wiley, 1994.

**19254E23BP****LEAN MANUFACTURING****4 0 0 4****AIM:**

To introduce the concepts of lean manufacturing system.

**OBJECTIVES:**

268

263



- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.

**UNIT – I INTRODUCTION TO LEAN MANUFACTURING 7**

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

**UNIT – II CELLULAR MANUFACTURING, JIT, TPM 9**

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

**UNIT – III SET UP TIME REDUCTION, TQM, 5S, VSM 10**

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

**UNIT – IV SIX SIGMA 9**

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

**UNIT – V CASE STUDIES 10**

Various case studies of implementation of lean manufacturing at industries.

**TOTAL: 45 PERIODS**

**BOOKS FOR REFERENCES:**

1. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003
2. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’ , Lean Enterprise Institute, Brookline, MA.
5. Mikell P. Groover (2002) ‘Automation, Production Systems and CIM.

Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsoring agent's requirements, Ethical, Training, Cooperation and Legal aspects.

**2. RESEARCH DESIGN** **10**

Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques, Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research. Research Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brain storming and Delphi Method.

**3. RESEARCH MODELING** **10**

Mathematical – Classification of Models, Development of Models, Stages in Model building, Principles of Modeling, Use of Analogy, Models as Approximations, Data consideration and Testing of Models (b) Heuristics and Simulation – Definition, Applications and reasons for using Heuristics, Heuristic Methods and approaches, Meta-Heuristics; Simulation – Meaning, Applications and Classification of Simulation Models, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.

**4. EXPERIMENTATION** **8**

Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments.

**5. PROCESS OPTIMIZATION AND ANALYSIS** **10**

Factorial Design principles, Two factor Factorial Design, General Factorial Design, Fitting response Curves and Surfaces, Blocking, Taguchi Approach to Parameter Design, Robust Design. Analysis of Variance and Co-variance, Hypothesis Testing – Parametric. Report Writing: Pre-writing Considerations, Principles of Thesis Writing, Format of Report Writing, Format of Publication in Research Journals

**REFERENCES FOR BOOKS:**

1. Krishnaswamy, K.N., Sivakumar, Appa Iyer & Mathirajan M., (2006) -Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, 5/e. (New York, John Wiley & Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, 2/e. (New Delhi, New Age International Ltd. Publishers)
4. Ross, Phillip J. (1996) – Taguchi Techniques for Quality Engineering, 2/e. (New York, McGraw Hill)
5. Rao S. S. (2004 ) – Engineering Optimization Theory & Practices, 3/e (New Delhi, New Age International Ltd., Publishers)

**19254E33AP MATERIALS MANAGEMENT AND LOGISTICS 4 0 0 4**

**AIM:**

To introduce to the students the various functions of materials management and logistics

**OBJECTIVE:**

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

**UNIT I INTRODUCTION**

**6**

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

**UNIT II MANAGEMENT OF PURCHASE**

**7**

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

**UNIT III MANAGEMENT OF STORES AND LOGISTICS**

**12**

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

**UNIT IV MATERIALS PLANNING**

**10**

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

**UNIT V INVENTORY MANAGEMENT**

**10**

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

**TOTAL: 45**

**BOOKS FOR REFERENCE:**

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. Guptha P.K. and Manmohan, Problems in Operations Research, Suttan Chand & Sons, 2003.
4. Dr.R. Kesavan, C.Elanchezian and B.Vijaya Ramnath, Production Planning and Control, Anuratha Publications, Chennai, 2008.
5. G. Reghuram, N. Rangaraj, Logistics and supply chain management – cases and concepts, Macmillan India Ltd., 2006.

**19254E33B P**

**MANAGEMENT**

**FINANCIAL**

**4 0 0 4**

**AIM:**

271

To introduce the concepts of financial and various functions of financial management so that the students will be able to handle higher level financial decisions.

**OBJECTIVES:**

To train students in various functions of finance such as working capital management, current assets management so that students will be able to make high investment decisions when they take up senior managerial positions.

**UNIT – I FINANCIAL ACCOUNTING**

**8**

Accounting principles - Basic records - Preparation and interpretation of profit and loss statement - balance sheet - Fixed assets - Current assets.

**UNIT – II COST ACCOUNTING**

**12**

Elements of cost - cost classification - material cost - labour costs - overheads - cost of a product - costing systems - cost determination - process - costing - Allocation of overheads - Depreciation - methods.

**UNIT – III MANAGEMENT OF WORKING CAPITAL**

**10**

Current assets - Estimation of working capital requirements - Management of accounts receivable - Inventory - Cash - Inventory valuation methods.

**UNIT – IV CAPITAL BUDGETING**

**8**

Significance of capital budgeting - payback period - present value method – accounting rate of return method - Internal rate of return method.

**UNIT – V PROFIT PLANNING AND ANALYSIS**

**7**

Cost - Volume profit relationship relevant costs in decision making profit management analysis - Break even analysis.

**TOTAL: 45 PERIODS**

**BOOKS FOR REFERENCE:**

1. Prasanna Chandra, Financial Management, Tata McGraw Hill, 1998.
2. G.B.S. Narang, Production and Costing, Khanna Publishers, 1993.
3. R. Kesavan, C.Elanchezian, Sundar Selwyn, Engineering Economics and Financial Accounting, Laxmi Publications, New Delhi, 2005.
4. R Kesavan, C. Elanchezian, B.Vijaramnath, Engineering Economics and Cost Analysis Anuratha Publications, Chennai.

**AIM:**

To impart the knowledge in manufacturing information system.

**OBJECTIVE:**

On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

**UNIT I INTRODUCTION****5**

The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

**UNIT II DATABASE****7**

Terminologies – Entities and attributes – Data models, schema and subschema - Data Independence – ER Diagram – Trends in database.

**UNIT III DESIGNING DATABASE****13**

Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query.

**UNIT IV MANUFACTURING CONSIDERATION****10**

The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the stock status database – the complete IOM database.

**UNIT V INFORMATION SYSTEM FOR MANUFACTURING****10**

Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems; Computer based production management system, computerized manufacturing information system – case study.

**TOTAL: 45 PERIODS****BOOKS FOR REFERENCE:**

1. Luca G.Sartori, “Manufacturing Information Systems”, Addison-Wesley Publishing Company, 1988.
2. Date.C.J.,”An Introduction to Database Systems” Addison Wesley, 8th Edn.,2003
3. Orlicky.G., “Material Requirements Planning”, McGraw-Hill, 1994.
4. Kerr.R, “Knowledge based Manufacturing Management”, Addison-Wesley,1991.
5. Manufacturing Information & Data Systems Analysis, Design & Practice,CECELJA FRANJO, 2002.

## List of Electives - Elective III

**19254E43AP**

**ADVANCED**

**METROLOGY AND COMPUTER AIDED INSPECTION 4004**

### **AIM:**

To give a thorough knowledge of measurement and instrumentation of increasing importance in industry. The student will be knowledgeable in various standards and proliferation of computerized and automated inspecting techniques along with the classical metrology.

### **OBJECTIVES:**

- To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries.
- Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

### **UNIT I GENERAL CONCEPTS OF MEASUREMENT**

**8**

Definition – Standards of measurement – Errors in measurement – Interchangeability and Selective assembly – Accuracy and Precision – Calibration of instruments.

### **UNIT II MEASUREMENT OF SURFACE FINISH AND MEASURING MACHINES**

**9**

Definitions – Types of Surface Texture: Surface Roughness Measurement Methods- Comparison, Profilometer, 3D Surface Roughness Measurement – Instruments.

### **UNIT III INTERFEROMETRY**

**8**

Interferometry – Introduction, Principles of light interference – Interferometers – Measurement and Calibration – Laser Interferometry.

### **UNIT IV COMPUTER AIDED AND LASER METROLOGY**

**10**

Tool Makers Microscope – Microhite – Co – Ordinate measuring machine – Applications – Laser Micrometer, Laser Scanning gauge, Non contact and in-process inspection, Vision system.

### **UNIT V IMAGE PROCESSING**

**10**

Overview, Computer imaging systems, Image Analysis, Preprocessing, Human vision system, Image model, Image enhancement, gray scale models, histogram models, Image Transforms.

**TOTAL: 45 PERIODS**

## **BOOKS FOR REFERENCE:**

1. GUPTA, I.C, “A Text Book of engineering metrology”, Dhanpat Rai and Sons, 1996.
2. G.N.GALYER F.W. and C.R.SHOTBOLT, “Metrology for engineers”, ELBS, 1990.
3. GRAHAM T.SMITH, “Industrial Metrology”, Springer, 2002
4. “ASTE Handbook of Industries Metrology”, Prentice Hall of India Ltd., 1992.
5. R.K.RAJPUT, “Engineering Metrology and Instrumentations”, Kataria & Sons Publishers, 2001.
6. MILAN SONKA, VACLAV HLAVAC and ROGER BOYLE, “Image Processing, Analysis, and Machine Vision”, Cengage-Engineering; 3 edition (March 19, 2007).

**OBJECTIVE:**

To understand the concepts of maintenance management and to have knowledge in developing a suitable maintenance system for any type of an organization.

**UNIT I: Introduction to Maintenance Management:**

7

Maintenance: Its role and scope in total Organizational contexts - role of Maintenance. Centralized and decentralized maintenance organization structures. Maintenance Economics – reliability and Availability – MTBF, MTTR.

**UNIT II: Maintenance Categories:**

10

Maintenance system– Categories - Design and its selection – Breakdown Maintenance –Routine Maintenance- Predictive Maintenance –Preventive Maintenance- Corrective Maintenance-Total Productive Maintenance –Maintenance Schedule – Repair Cycle.

**UNIT III: Spare Parts Management:**

8

Pareto's principles for repetitive breakdown analysis, spares management, planning considerations for each type of activities.

**UNIT – IV: Condition Monitoring:**

10

Condition Monitoring (CM) – Introduction- Economics of CM – On-load and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

**UNIT V: Maintenance Manpower Cost, Performance Management:**

10

Maintenance man power planning - Selection training - Scheduling maintenance costs - Budget preparation and budgetary control of maintenance expenditures Maintenance effectiveness various performance indices - evaluation, uses and limitations - Monitoring of Maintenance performance.

**BOOKS FOR REFERENCE:**

1. Gopalakrishnan P. and Sundarajan 1996. Maintenance Management. New Delhi, Prentice-Hall of India.
  2. Srivastava S.K., "Industrial Maintenance Management", - S. Chand & Co.,1981.
  3. Higgirs L.T and Morrow L.C., 1997, ``Maintenance Engineering Handbook``, McGraw Hill.
- Armstrong, "Condition Monitoring", BSIRSA, 1988.



## **19254E43CP OPTIMIZATION TECHNIQUES 3 1 0 4**

### **UNIT I - INTRODUCTION TO OPTIMIZATION 7**

Formulation of an optimization problem- Classification of optimization problem – optimization techniques- Classical optimization technique – Single variable optimization – Multi variable optimization algorithms

### **UNIT II - MINIMIZATION METHODS 8**

One dimensional minimization methods: unimodal function – elimination methods: unrestricted search, exhaustive search, Dichotomous search, Fibonacci methods, Golden section methods, Interpolation methods: Quadratic and cubic interpolation methods.

### **UNIT III - CONSTRAINED OPTIMIZATION TECHNIQUES 10**

Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions, Lagrange multipliers - separable programming and Geometric programming.

### **UNIT IV - UNCONSTRAINED OPTIMIZATION TECHNIQUES 10**

Multi variable unconstrained optimization techniques: Direct search methods: Random search method, unvaried method, pattern search method, steepest descent method and Conjugate gradient method.

### **UNIT V - APPLICATIONS OF HEURISTICS IN OPTIMIZATION 10**

Heuristics-Introduction-Multi objective optimization: Genetic algorithms and Simulated Annealing techniques; neural network & Fuzzy logic principles in optimization.

#### **BOOKS FOR REFERENCE:**

1. Rao, Singaresu, S., “Engineering Optimization – Theory & Practice”, New Age International (P) Limited, New Delhi, 2000.
2. Johnson Ray, C., “Optimum design of mechanical elements”, Wiley, John & Sons, 1990.
3. Kalyanamoy Deb, “Optimization for Engineering design algorithms and Examples”, Prentice Hall of India Pvt. 1995.
4. Goldberg, D.E., “Genetic algorithms in search, optimization and machine”, Barmen, Addison-Wesley, New York, 1989.

## List of Electives - Elective IV

### **19254E51AP MANUFACTURING SYSTEMS AND SIMULATION 4004**

#### **AIM:**

To introduce the various concepts of manufacturing system simulation.

#### **OBJECTIVES:**

- To model manufacturing systems of different kinds.
- To make use of simulation languages for manufacturing systems.

#### **UNIT I INTRODUCTION**

**8**

Basic concepts of system – elements of manufacturing system - concept of simulation – simulation as a decision making tool – types of simulation – Monte-Carlo simulation - system modeling – types of modeling – Limitations and Areas of application of simulation.

#### **UNIT II RANDOM NUMBERS**

**10**

Probability and statistical concepts of simulation – Pseudo random numbers – methods of generating random numbers – discrete and continuous distribution – testing of random numbers – kolmogorov-mirnov test, the Chi-Square test - sampling - simple, random and simulated.

#### **UNIT III DESIGN OF SIMULATION EXPERIMENTS**

**10**

Problem formulation – data collection and reduction – time flow mechanical – key variables - logic flow chart starting condition – run size – experimental design consideration – output analysis, interpretation and validation – application of simulation in engineering industry.

#### **UNIT IV SIMULATION LANGUAGE**

**9**

Comparison and selection of simulation languages - Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.

#### **UNIT V CASE STUDIES**

**10**

Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems – case studies.

#### **TOTAL: 45 PERIODS**

#### **BOOKS FOR REFERENCE:**

1. Jerry Banks and John S. Carson, “Discrete event system simulation”, Prentice Hall 1991
2. 1 .John H. Mize and J. Grady Cox, “Essentials of simulation” – Prentice hall 1989.
3. Geoffrey Gordon “System simulation” – Prentice Hall of India, 1992
4. Jeffrey L. Written, Lonnie D, Bentley and V.M. Barice, “System analysis and Design Methods”, Galgotia publication, 1995
5. Averill M. Law and W. David Kelton, “Simulation Modeling and analysis”, McGraw Hill International Editions, 1991

6. Shannon R.E., "System simulation", Prentice Hall 1993.

**19254E51BP INSTRUMENTATION AND CONTROL ENGINEERING 4004**

**UNIT-I: Introduction to Instrumentation:**

**8**

Mechanical Instrumentation- General concepts, General measurement system. Classification of Instruments - indicators, recorders and integrators- working principles, Precision and Accuracy: Measurement Error and calibration.

**UNIT-II: Measuring Devices**

**10**

Measurement of speed, frequency, acceleration - Vibrometer, Accelerometer etc. Pressure measurement: Gravitational, Bourdon, elastic transducers, strain gauge, pressure cells, and measurement of high and low pressure. Temperature measurement: Bi-Metallic, Resistance Thermometer, Thermocouples, Pyrometer, thermostats, Magnetic flow meter, Ultrasonic flow meter.

**UNIT - III: Transducers:**

**8**

Transducers – Introduction – Types -Variable resistance Transducers-Variable reactive transducers- Piezo Electric transducers- Fibre optic transducers- Laser instrumentation-analogue and digital type -incremental and absolute measurement.

**UNIT – IV: Machine Diagnostic and Condition Monitoring:**

**10**

Machine Diagnostics – Basic Concepts - Analysis of failure in machines-Distribution of fault occurrences-Objectives of monitoring-Monitoring techniques applied to Machineries.

**UNIT – V: Computer Control System:**

**9**

Data acquisition system-Introduction-Direct Digital control-Programmable Logic Controls (PLC) -Ladder diagrams-Communication used in PLC.

**BOOKS FOR REFERENCE:**

1. Thomas Beckwith, Lewis Buck N.Ray, D. Maragoni, "Mechanical Measurements", Narosia Publishing House, NewDelhi.
2. M.P.Groover - " Automation, Production Systems and computer Intergrated Manufacturing ", Prentice Hall.
3. A.K. Sawhney, "Electrical and Electronics Measurements & Instrumentation", Dhanpat Rai & Sons, 1993
4. C.S.Rangan,V.S.V.Mani and G.R.Sarma - " Instrumentation Devices and systems", Tata McGraw Hill,1983

## **19254E51CP ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS 3 1 0 4**

### **UNIT – I - Neural Networks**

**8**

Introduction to soft Computing-Neural Networks-Supervised Learning Neural Networks – Perceptrons – Adaline – Back propagation Multilayer perceptrons – Radial Basic Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Habbian Learning.

### **UNIT – II - Fuzzy Logic:**

**10**

Fuzzy Sets – Basic Definition and Terminology – Set –theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning. Fuzzy Logic: 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 – III Genetic Algorithm:**

**9**

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 – IV Neuro Fuzzy Modeling:**

**10**

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 Applications:**

**8**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction – Single MLP approaches –CANFIS modeling for color recipe prediction

### **BOOKS FOR REFERENCE:**

1. Jang, J.S.R., C.T. Sun and E. Mizutani., “Neuro – Fuzzy and Soft Computing”, PHI, Person Education, 2004.
2. Eberhart, R., simpson, P. and Dobbins, R., “ Computatuonal Intelligence PC Tools”, AP Professional, Boston 1996.
3. Goldberg, Davis E., “Optimization and Machine Learning” Addison Wesley, New York, 1989.
4. S. Rajasekaran and Pai, G.A.V., “Neural Networks, Fuzzy Logic and Genetic Algorithms”,Prentice Hall of India, New Delhi, 2003.

## **List of Electives - Elective V**

### **19254E52AP PRODUCT DESIGN AND DEVELOPMENT 4004**

#### **UNIT I - INTRODUCTION**

**7**

Significance of product design, product design and development process, sequential engineering design method, the challenges of product development.

#### **UNIT II - PRODUCT PLANNING AND PROJECT SELECTION 8**

Identifying opportunities evaluate and prioritize projects, allocation of resources  
Identifying Customer Needs, Interpret raw data in terms of customers need, organize needs in hierarchy and establish the relative importance of needs.

#### **UNIT III - PRODUCT SPECIFICATIONS**

**8**

Establish target specifications, setting final specifications, Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally.

#### **UNIT IV - INDUSTRIAL DESIGN AND CONCEPT SELECTION 10**

Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, Overview, concept screening and concept scoring, methods of selection.

#### **UNIT V - THEORY OF INVENTIVE PROBLEM SOLVING (TRIZ) AND CONCEPT TESTING 12**

Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model-based technology for generating innovative ideas Elements of testing: qualitative and quantitative methods including survey, measurement of customers' response, Intellectual Property: Elements and outline, patenting procedures.

#### **BOOKS FOR REFERENCE:**

1. Ulrich K. T, and Eppinger S.D, Product Design and Development, Tata McGraw Hill
2. Otto K, and Wood K, Product Design, Pearson
3. Engineering of creativity: introduction to TRIZ methodology of inventive Problem Solving, By Semyon D. Savransky, CRC Press.
4. Inventive thinking through TRIZ: a practical guide, By Michael A. Orloff, Springer.
5. Systematic innovation: an introduction to TRIZ ; (theory of inventive Problem Solving), By John Terninko, Alla Zusman, CRC Press.

## **19254E52BP FLUID POWER AUTOMATION 4 0 0 4**

### **AIM:**

To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

### **OBJECTIVE:**

- To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.
- To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

### **UNIT I INTRODUCTION 5**

Need for Automation, Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.

### **UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS 8**

Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators – standard circuit symbols, circuit (flow) analysis.

### **UNIT III CONTROL AND REGULATION ELEMENTS 8**

Direction flow and pressure control valves-Methods of actuation, types, sizing of ports pressure and temperature compensation, overlapped and under lapped spool valves operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

### **UNIT IV CIRCUIT DESIGN 10**

Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.

### **UNIT V ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS 7**

Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

### **TOTAL: 45 PERIODS**

### **BOOKS FOR REFERENCE:**

1. Antony Esposito, Fluid Power Systems and control Prentice-Hall, 1988.
2. Peter Rohner, Fluid Power logic circuit design. The Macmillan Press Ltd., London, 1979
3. E.C.Fitch and J.B.Suryaatmadyn. Introduction to fluid logic, McGraw Hill, 1978.
4. W.Bolton, Mechatronics, Electronic control systems in Mechanical and Electrical Engineering Pearson Education, 2003.
5. Peter Rohner, Fluid Power Logic Circuit Design, Mcmelan Prem, 1994.

## **List of Electives - Elective VI**

### **19254E53AP ADVANCED MATERIAL TECHNOLOGY 4 0 0 4**

#### **AIM:**

To impart knowledge on advance concepts of material technology

#### **OBJECTIVE:**

- To enlight the PG students on elastic, plastic and fractured behaviour of engineering Materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

#### **UNIT I ELASTIC AND PLASTIC BEHAVIOR 10**

Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

#### **UNIT II FRACTURE BEHAVIOUR 10**

Griffith's theory, stress intensity factor and fracture toughness – Toughening mechanisms – Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law. Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

#### **UNIT III SELECTION OF MATERIALS 10**

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

#### **UNIT IV MODERN METALLIC MATERIALS 8**

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nano crystalline materials.

#### **UNIT V NON METALLIC MATERIALS 7**

Polymeric materials – Formation of polymer structure – Production techniques of fibers, foams, adhesives and coating – structure, properties and applications of engineering polymers – Advanced structural ceramics, WC, TiC, TaC, Al<sub>2</sub>O<sub>3</sub>, SiC, Si<sub>3</sub>N<sub>4</sub> CBN and diamond – properties, processing and applications.

#### **TOTAL: 45 PERIODS**

#### **BOOKS FOR REFERENCE:**

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
2. Thomas H. Courtney, Mechanical Behaviour of Materials, (2nd edition), McGraw Hill, 2000.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4<sup>th</sup> Edition) Jaico, 1999.
4. ASM Hand book, Vol.11, Failure Analysis and Prevention, (10th Edition), ASM, 2002.

5. Ashby M.F., Material Selection in Mechanical Design, 3rd Edition, Butter Worth 2005.





# **PRIST DEEMED TO BE UNIVERSITY**

**Vallam, Thanjavur**

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF  
ELECTRONICS & COMMUNICATION ENGINEERING**

# **PROGRAM HANDBOOK**

**B.TECH – PART TIME**

[REGULATION 2019]

**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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- 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
<b>1</b>	3	3	2	3	2	1	1	2	1	1	3	1	3
<b>2</b>	3	3	3	3	3	1	1	1	1	1	1	2	2
<b>3</b>	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 (PART TIME) – ECE – R-2019****SEMESTER I – VII CURRICULUM****SEMESTER-I**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19148S11P	Transforms and Partial Differential Equations	3	1	0	4
2	19152C12P	Electromagnetic Theory	3	1	0	4
3	19152C13P	Digital Electronics	3	1	0	4
4	19152C14P	Electronic Circuits - I	3	0	0	3
5	19152C15P	Signals and Systems	4	0	0	4
<b>TOTAL CREDITS</b>						<b>19</b>

**SEMESTER-II**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19148S21P	Numerical Methods	3	1	0	4
2	19152C22P	Electrical Engineering and Control Systems	3	0	0	3
3	19152C23P	Linear Integrated Circuits	3	1	0	4
4	19152C24P	Electronic Circuits - II	3	1	0	4
5	19152C25P	Transmission Lines and Waveguides	4	0	0	4
<b>TOTAL CREDITS</b>						<b>19</b>

**SEMESTER-III**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1.	19148S31BP	Probability and Random Processes	3	1	0	4
2.	19152C32P	Microprocessor Interfacing and Applications	3	1	0	4
3.	19152C33P	Digital Signal Processing	3	1	0	4
4.	19152C34P	Communication Theory	3	1	0	4
5.	19152L35P	Digital Signal Processing and Microprocessor Lab	0	0	3	2
<b>TOTAL CREDITS</b>						<b>18</b>

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

**SEMESTER-IV**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19152C41P	Digital Communication	3	1	0	4
2	19152C42P	Antenna and Wave Propagation	3	1	0	4
3	19152C43P	Computer Networks	4	0	0	4
4	19152E44_P	Elective-I	4	0	0	4
5	19152L45P	Networks and Communication Lab	0	0	3	2
<b>TOTAL CREDITS</b>						<b>18</b>

**SEMESTER-V**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19152C51P	Optical Communication and Networks	4	0	0	4
2	19152C52P	Microwave Engineering	4	0	0	4
3	19152C53P	VLSI Design	3	1	0	4
4	19152E54_P	Elective II	4	0	0	4
5	19152L55P	Optical Communication and Microwave Lab	0	0	3	2
<b>TOTAL CREDITS</b>						<b>18</b>

**SEMESTER-VI**

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19152C61P	Mobile and Wireless Communication	4	0	0	4
2	19152C62P	Medical Electronics	3	1	0	4
3	19152C63P	Microcontroller and Embedded Systems	3	1	0	4
4	19152E64_P	Elective III	4	0	0	4
5	19152L65P	VLSI and Embedded Systems Lab	0	0	3	2
<b>TOTAL CREDITS</b>						<b>18</b>

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

### SEMESTER-VII

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	19160S71P	Total Quality Management	3	0	0	3
2	19152C72P	Wireless Networks	3	1	0	4
3	19152C73P	Telecommunication Switching and Networks	4	0	0	4
4	19152E74_P	Elective IV	3	0	0	3
5	19152P75P	Project Work	0	0	12	6
<b>TOTAL CREDITS</b>						<b>20</b>

### LIST OF ELECTIVES

#### ELECTIVE-I (SEMESTER-IV)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	19152E44AP	High Speed Networks	4	0	0	4
2	19152E44BP	Advanced Digital Signal Processing	4	0	0	4
3	19152E44CP	Speech Processing	4	0	0	4
4	19152E44DP	Fuzzy Logic and Neural Networks	4	0	0	4
5	19152E44EP	Advanced Electronic System Design	4	0	0	4

#### ELECTIVE-II (SEMESTER-V)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	19152E54AP	Environmental Science and Engineering	4	0	0	4
2	19152E54BP	Optoelectronic Devices	4	0	0	4
3	19152E54CP	Radar and Navigational Aids	4	0	0	4
4	19152E54DP	Digital Image Processing	4	0	0	4
5.	19152E54EP	Engineering Acoustics	4	0	0	4

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTIVE-III (SEMESTER-VI)**

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	19152E64AP	Principles Of Management	4	0	0	4
2	19152E64BP	Satellite Communication	4	0	0	4
3	19152E64CP	Robotics	4	0	0	4
4	19152E64DP	Remote sensing	4	0	0	4
5.	19152E64EP	Network Security	4	0	0	4

**ELECTIVE-IV (SEMESTER-VII)**

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	19152E74AP	Power Electronics	3	0	0	3
2	19152E74BP	Advanced Microprocessors	3	0	0	3
3	19152E74CP	Electromagnetic Interference and Compatibility	3	0	0	3
4	19152E74DP	Solid State Electronic Drives	3	0	0	3
5	19152E74EP	Computer Hardware and Interfacing	3	0	0	3

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

## B.TECH (PART TIME) – ECE – R-2019

### COURSE STRUCTURE AND CREDITS DISTRIBUTION

Sem.	Core Courses				Elective Courses		Total Credits
	Theory Courses		Practical Courses				
	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	05	19	-	-	-	-	19
II	05	19	-	-	-	-	19
III	04	16	01	02	-	-	18
IV	03	12	01	02	01	04	18
V	03	12	01	02	01	04	18
VI	03	12	01	02	01	04	18
VII	03	11	01	06	01	03	20
Total Credits							130

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP



**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS****3 1 0 4**

(Common to CSE, IT, ECE)

**AIM**

The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. 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 post graduate and specialized studies and research.

**OBJECTIVES**

At the end of the course the students would

- Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
- Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.

**UNIT I      FOURIER SERIES      9**

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**

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**

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

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

**UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9**

Solution of First order partial differential equation reducible to standard forms – Lagrange’s linear equation – Linear partial differential equations of second order and higher order with constant coefficients.

**UNIT V BOUNDARY VALUE PROBLEMS 9**

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.

**TUTORIAL :15**

**TOTAL: 60**

**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.

**REFERENCES**

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTROMAGNETIC THEORY****3 1 0 4****AIM**

To familiarize the student to the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields so that an in depth understanding of antennas, electronic devices, waveguides is possible.

**OBJECTIVES**

- To analyze fields a potentials due to static changes
- To evaluate static magnetic fields
- To understand how materials affect electric and magnetic fields
- To understand the relation between the fields under time varying situations
- To understand principles of propagation of uniform plane waves.

**UNIT I STATIC ELECTRIC FIELDS 9**

Vector field. Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co-ordinate System – calculation of length area and volume. Definition of Curl, Divergence and Gradient – Meaning of Strokes theorem and Divergence theorem .

Coulomb's Law– Definition of Electric Field Intensity –Electric Field due to discrete charges – charges distributed uniformly on an infinite line – Electric Scalar Potential – Relationship between potential and electric field - Potential due to infinite uniformly charged line –Electric Flux Density – Gauss Law – Proof of Gauss Law.

**UNIT II STATIC MAGNETIC FIELD 9**

The Biot-Savart Law in vector form –Magnetic field and Magnetic flux density- Magnetic Field intensity due to a infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I –Calculation of field using Ampere's circuital law for symmetrical distributions a) infinitely long solenoid and b) coaxial cable. The Lorentz force equation for a moving charge and applications –Scalar and Vector Magnetic Potential.

**UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9**

Poisson's and Laplace's equation – Electric Polarization- Definition of Capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law –

Definition of Inductance - Inductance of loops– Definition of mutual inductance. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability - magnetic boundary conditions.

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

#### **UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9**

Faraday's law – Displacement current – Generalization of Ampere's circuital law. Maxwell's Equation in integral form from Faraday's Law – Maxwell's Equation expressed in point form from Faraday's Law.

Poynting Vector Poynting Theorem and the flow of power – Power flow in a co-axial cable – Instantaneous Average and Complex Poynting Vector.

#### **UNIT V ELECTROMAGNETIC WAVES 9**

Derivation of Wave Equation –. Properties of Uniform Plane Wave — Wave equation for a conducting medium– Plane waves Propagation in good dielectrics --- Plane waves Propagation in good conductors – Skin effect.

Linear, Elliptical and circular polarization –normal incidence and Oblique incidence – Reflection of Plane Waves by a perfect dielectric Brewster angle .Surface impedance

**TUTORIAL 15**

**TOTAL : 60**

#### **TEXTBOOKS**

1. William H.Hayt : “Engineering Electromagnetics” TATA 2003 (Unit I,II,III ).
2. E.C. Jordan & K.G. Balmain “Electromagnetic Waves and Radiating Systems.” Prentice Hall of India 2<sup>nd</sup> edition 2003. (Unit IV, V). McGraw-Hill, 9<sup>th</sup> reprint

#### **REFERENCES**

1. Ramo, Whinnery and Van Duzer: “Fields and Waves in Communications Electronics” John Wiley & Sons (3<sup>rd</sup> edition 2003)
2. .Narayana Rao, N : “Elements of Engineering Electromagnetics” 4<sup>th</sup> edition, Prentice Hall of India, New Delhi, 1998.
3. M.N.O.Sadiku: “Elements of Engineering Electromagnetics” Oxford University Press, Third edition.
4. David K.Cherp: “Field and Wave Electromagnetics - Second Edition-Pearson Edition.
5. David J.Grithiths: “Introduction to Electrodynamics- III Edition-PHI.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**DIGITAL ELECTRONICS****3 1 0 4****AIM**

To learn the fundamental concepts those are useful for designing digital systems or circuits.

**OBJECTIVES**

- To introduce number systems and codes
- To introduce basic postulates of Boolean algebra and shows 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 memories devices.

**UNIT I:                    BOOLEAN ALGEBRA AND MINIMIZATION                    9**

Basic theorems – Boolean functions – Canonical and Standard forms – Minimization techniques – K-map up to five variables – NAND and NOR implementation – Exclusive OR function - Hardware Description Language (HDL).

**UNIT II:                    DIGITAL LOGIC FAMILIES                    9**

Switching operation of PN junction diode – bipolar and MOS devices – Bipolar logic families – RTL – DTL – DCTL – HTL – TTL – ECL – MOS and CMOS – Tristate logic – Interfacing of CMOS and TTL families.

**UNIT III:                    COMBINATIONAL LOGIC DESIGN                    9**

Design using gates – BCD arithmetic circuits – Binary adder – Subtractor – Multiplier – Divider – Design using MSI devices – Multiplexer and Demultiplexer as logic elements – Encoder and decoder – Parity checker – Parity generator – Code converter – Magnitude comparator.

**UNIT IV:                    SEQUENTIAL LOGIC DESIGN                    9**

Flip Flops and their conversions – Analysis and synthesis of synchronous sequential circuits – Excitation table – State table and state diagram – Design of synchronous counters – Analysis of asynchronous sequential circuits – Reduction of state and flow table – Race free state assignment – Design of Asynchronous counters – Timing diagram – Shift registers and their applications.

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

**UNIT V : MEMORY DEVICES 9**

Classification of memories – ROM organization – PROM – EPROM – EEPROM – EAPROM – RAM organization – Write operation – Read operation – Memory cycle Timing wave forms – Memory decoding – Memory expansion – Static RAM Cell- Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) –Field Programmable Gate Arrays (FPGA).

**TUTORIAL 15**

**TOTAL : 60**

**TEXT BOOKS**

1. Morris Mano M., “Digital Design”, 3rd Edition, Pearson Education, 2007.
2. John M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2002.

**REFERENCES**

1. John F.Wakerly, “Digital Design”, 4th Edition, Pearson/PHI, 2006
2. Charles H.Roth, “ Fundamentals of Logic Design”, Thomson Learning, 2003.
3. Donald P.Leach and Albert Paul Malvino, “Digital Principles and Applications”, 6th Edition, TMH, 2003.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTRONIC CIRCUITS –I****3 0 0 3****AIM**

The aim of this course is to familiarize the student with the analysis and design of basic transistor Amplifier circuits and power supplies.

**OBJECTIVE**

On completion of this course the student will understand

- The methods of biasing transistors
- Design of simple amplifier circuits
- Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers and heat sinks
- Analysis and design of power supplies

**UNIT – I TRANSISTOR BIASING & STABILIZATION 9**

Biasing circuits for BJT- DC load line-AC load line – Stability factor- Methods of Transistor Biasing- Bias Compensation – Thermal runaway- heat sink- FET Biasing

**UNIT-II LOW FREQUENCY AMPLIFIER ANALYSIS & DESIGN 9**

Transistor- FET amplifiers - Low frequency Small signal hybrid parameter model :  $C_B, C_E, C_C$  Amplifier- Analysis of Transistor Amplifier Using h-parameter.  
JFET as an Amplifier- Analysis of low frequency common Source & Common Drain Amplifier Using h-parameter.

**UNIT – III MULTISTAGE AMPLIFIERS 9**

Cascading of BJT Amplifiers- Analysis of RC coupled Amplifiers Methods of Increasing Input impedance using Darlington and Boot strapping- Emitter coupled Differential Amplifier, Differential gain, CMRR, Transfer Characteristics – Cascode amplifier.

**UNIT – IV HIGH FREQUENCY ANALYSIS OF THE AMPLIFIERS 9**

Frequency response-Effect of Coupling and Bypass capacitor- Effect of internal transistor capacitance-Miller Effect – High Frequency  $\pi$  model for  $C_E$  Amplifier- $C_E$  Short circuit Current gain- Cut off frequencies  $f_\alpha, f_\beta, f_T$  - Gain Band Width product.

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

**UNIT – V POWER SUPPLIES****9**

Half wave, Full Wave, Rectifiers- Capacitor Filter- Linear Regulator: Shunt Regulator, Series Regulator- Shunt Regulator using Zener Diode- Switch Mode Power Supply.

**TUTORIAL 15****TOTAL : 60****TEXT BOOK**

1. Millman and Halkias.c.“Integrated Electronics” Tata McGraw -Hill,1991

**REFERENCE BOOKS**

1. David A. Bell,”Electonic Devices And Circuits “ Prentic Hall of India,1998.
2. Donal L. Schilling, Charles ,Belove “Electronic Circuits” Third Edition 2002.
3. Salivahanan “Electonic Devices And Circuits”
4. Boylestead, Robert L. and Louis Nasheresky- “Electonic Devices And Circuit Theory”-Pearson Education
5. J.B.Gupta - “Electonic Devices And Circuits”-S.K.Kataria and sons 2004.

**SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENUEURSHIP**



**19152C15P**

**SEMESTER I**

**SIGNALS AND SYSTEMS**

**4 0 0 4**

(Common to ECE & IT)

**AIM**

To study and analyze the characteristics of continuous, discrete signals and systems.

**OBJECTIVES**

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.

**UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9**

Continuous time signals (CT signals), discrete time signals (DT signals) - step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, Random signals, Classification of systems (CT systems and DT systems) Linear time invariant systems.

**UNIT II ANALYSIS OF CT SIGNALS 9**

Fourier Transform and Laplace Transform in Signal Analysis. Fourier series, Fourier Transform and Laplace Transform properties, Parseval's relation.

**UNIT III LTI-CT SYSTEMS 9**

Differential equation, Block diagram representation, Impulse response, Convolution Integral, Frequency response, Fourier Methods and Laplace transforms in analysis.

**UNIT IV SAMPLING THEOREM AND ANALYSIS OF DT- SIGNALS 9**

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals  
Z-transform definition – region of convergence – properties of ROC – Properties of z transform – Poles and Zeros – inverse z-transform, Relationship between z-transform and Fourier transform.

**UNIT V LTI-DT SYSTEMS 9**

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, Z-transform analysis.

**TUTORIAL 15**

**TOTAL : 60**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

### **TEXT BOOK**

1. Alan V. Oppenheim, Alan S. Willsky with S. Hamid Nawab, Signals & Systems, 2<sup>nd</sup> edn., Pearson Education, 1997.

### **REFERENCES**

1. M. J. Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999
3. K. Lindner, "Signals and Systems", McGraw Hill International, 1999.

**NUMERICAL METHODS**  
(Common to CSE, IT, ECE)

**AIM**

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

**OBJECTIVES**

At the end of the course, the students would be acquainted with the basic concepts in numerical methods.

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigenvalue problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

**UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**

Newton Raphson's method – Iteration method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

**UNIT II INTERPOLATION 9**

Newton's forward and backward difference formulas – Central difference formula: Bessels and Stirling's formula - Lagrangian Polynomials – Divided difference method .

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

### **UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

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**

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**

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.

**TUTORIAL 15**

**TOTAL : 60**

#### **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**

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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTRICAL ENGINEERING AND CONTROL SYSTEMS****3 0 0 3****AIM**

To familiarize the students with concepts related to the operation analysis and stabilization of control systems

**OBJECTIVES**

- To understand the operation of Electrical machines and transformers
- To understand the open loop and closed loop (feedback ) systems
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems

**UNIT-I: D.C MACHINES AND TRANSFORMERS 12**

Construction and operation of D.C. generators – emf equation – characteristics – principle of operation of D.C. motors. Principle of operation of transformers -parameters of transformers – regulation, losses and efficiency - introduction to three phase transformers.

**UNIT-II SPECIAL MACHINES 9**

Constructional details and principle of operation of single phase induction motors and Three Phase Induction motors– servomotor, stepper motor, variable reluctance motors.- applications.

**UNIT III INTRODUCTION TO CONTROL THEORY 6**

The control problem – differential equation of physical systems – control over system dynamics by feedback – regenerative feedback – transfer function – block diagram - algebra – signal flow graphs.

**UNIT IV TIME RESPONSE AND FREQUENCY RESPONSE ANALYSIS 12**

Time response of first and second order system – steady state errors – error constants – design specification of second order systems – state variable analysis – simple problems. Correlation between time and frequency response – polar plots , Bode plots – stability in frequency domain using Nyquist stability criterion – simple problems.

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

## **UNIT V STABILITY**

**6**

Concept of stability – stability conditions and criteria – Hurwitz and Routh criterion – relative Stability analysis.

**TUTORIAL :15**

**TOTAL :60**

### **TEXT BOOK:**

1. D.P.Kothari and I.J. Nagrath “Basic Electrical Engineering”, Tata McGraw Hill Ltd, second edition, 2002.
2. I.J.Nagrath and M.Gopal “Control system Engineering” New age International Publishing Company Ltd, third edition 2003.

### **REFERENCES:**

1. Stephen J.Chapman “Electrical Machinery Fundamentals”, McGraw Hill Publishing Company Ltd, third edition, 1999.
2. K.Murugesh Kumar, “Electric Machines”, Vikas Publishing House (P) Ltd, 2002.
3. M.Gopal “Control Systems – Principle and Design”, McGraw Hill Publishing company Ltd, second edition, 2003.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**LINEAR INTEGRATED CIRCUITS****3 1 0 4****AIM**

To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

**OBJECTIVES**

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce a few special function integrated circuits.

**UNIT I OP AMP CHARACTERISTICS AND APPLICATIONS 9**

Ideal op amp, IC op amp, DC characteristics: bias, offset and drift, AC characteristics: bandwidth, slew rate, noise and frequency compensation, basic op amp application: scale changer, inverter and non inverter, summer & subtractor, , differentiator & integrator, instrumentation amplifier, V to I and I to V converter, RC active filters: low pass and band pass filters op amp circuits using diodes: precision rectifier, clipper and clamper,

**UNIT II COMPARATORS AND SIGNAL GENERATORS 9**

Comparator and applications of comparator, regenerative comparator (Schmitt trigger), square wave generator (astable multivibrator), monostable multivibrator Triangular wave generator, saw tooth wave generator sine wave generators

**UNIT III ANALOG MULTIPLIER AND PLL 9**

Multiplier, Applications of multiplier: multiplying DC voltages, frequency doubling, phase angle detection, AM modulation/demodulation. PLL: Basic principles, analog and digital phase detector and comparator Voltage controlled Oscillator, Applications of PLL

**UNIT IV ADC AND DAC 9**

Analog switches, High speed sample and hold circuits, characteristics DAC, Types of D/A converter, Current driven DAC, Switches for DAC, characteristics of A/D converter Types of A/D converter, - Single slope, Successive approximation.

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

## **UNIT V SPECIAL FUNCTION ICS 9**

555 timer functional diagram, Astable and Monostable Multivibrators using 555 Timer, Voltage regulators-linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, and Isolation Amplifiers, Fiber optic ICs and Opto-couplers.

**TUTORIAL 15**

**TOTAL : 60**

### **TEXT BOOK**

1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.
2. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.

### **REFERENCES**

1. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall of India, 1996.
2. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3. K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.
4. Millman.J. and Halkias.C.C. 'Integrated Electronics', McGraw-Hill, 1972.
5. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits' Pearson Education, 2004.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



**ELECTRONIC CIRCUITS -II****3 1 0 4****AIM**

The aim of this course is to familiarize the student with the analysis and design of feed back amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators.

**OBJECTIVES**

On completion of this course the student will understand

- The advantages and method of analysis of feed back amplifiers
- Analysis and design of RC and LC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time based generators.

**UNIT I : POWER AMPLIFIERS****9**

Classification, Efficiency of Class A , RC coupled, Transformer coupled, Class B push pull, Complementary symmetry power amplifier, Power Output, Efficiency and Power Dissipation, cross over distortion & Elimination, Heat sink.

**UNIT II: FEEDBACK AMPLIFIERS****9**

Feedback concept, Four basic types of feedback, Equivalent Circuits of voltage amplifier, Current Amplifier ,Trans conductance, Trans resistance amplifier, Transfer ratio for negative feedback, Effect of feedback on noise, distortion gain input & output, impedance of the amplifier. Method of identifying feedback topology, Analysis of four types of feedback amplifier.

**UNIT III: OSCILLATORS****9**

Theory of Oscillator, Closed loop gain of the circuits, Barkhausen Criterion. Analysis & Design of RC Phase Shift Oscillators, Wien Bridge Oscillator, Hartley Oscillator Colpitts Oscillator, crystal Oscillator, frequency Stability.

**UNIT IV: TUNED AMPLIFIERS****9**

Tuned Circuit, Resonance, Q factor, Classification of tuned amplifier, Analysis of single tuned amplifier, Capacitance coupling, Effect of cascading single tuned amplifier on Band width, Double tuned amplifier, instability of tuned amplifiers- stabilization techniques, Narrow band neutralization using coil, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.

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

## **UNIT V: WAVE SHAPING, SWEEP & MULTIVIBRATOR CIRCUITS 9**

RL & RC Integrator and Differentiator circuits. Voltage sweep circuit , Miller sweep generator, UJT saw tooth generator, current time base generator, Collector coupled Astable Multivibrator, Collector coupled Monostable Multivibrator - Bistable Multivibrator - Schmitt trigger circuits.

**TUTORIAL 15**

**TOTAL : 60**

### **Text Books:**

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill 1991
2. Schilling Charles Belowe, " Electronic Circuits ", Third Edition, 2002.
3. Millman J. and Taub H., " Pulse Digital and Switching waveform ", McGraw Hill International.
4. Robert L. Boylest and Louis Nasheresky, "Electronic Devices and Circuits theory" 8<sup>th</sup> edn., PHI, 2002.

### **References:**

1. Sedra / Smith, "Micro Electronic Circuits" Oxford University Press, 2004.
2. David A.Bell, "Solid State Pulse Circuits", Prentice Hall of India, 1992.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**TRANSMISSION LINES AND WAVEGUIDES****4 0 0 4****AIM**

To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.

**OBJECTIVES**

- To become familiar with propagation of signals through lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

**UNIT I TRANSMISSION LINE THEORY 9**

Different types of transmission lines – Definition of Characteristic impedance and Propagation Constant, General Solution of the transmission line – wavelength and velocity of propagation. Waveform distortion – distortion less transmission line – Input impedance of lossless lines – reflection on a line not terminated by  $Z_0$  - reflection factor and reflection loss – Numerical problems.

**UNIT II THE LINE AT RADIO FREQUENCIES 9**

Standing waves and standing wave ratio on a line – One-eighth wave line – The quarter wave line and impedance matching – the half wave line – The Smith Chart – Application of the Smith Chart – Problems using smith chart (how to use smith chart and mark impedances, finding input impedance, SWR, reflection coefficient, finding load impedance) single stub matching - Numerical problems.

**UNIT III GUIDED WAVES 9**

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation. – Wave impedances – Numerical problems.

**UNIT IV RECTANGULAR WAVEGUIDES 9**

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – cut-off wavelength and phase velocity - Dominant mode in rectangular waveguide –Wave impedance, Characteristic impedance - Numerical problems.

**UNIT V CIRCULAR WAVE GUIDES AND RESONATORS 9**

TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities,

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

Rectangular cavity resonators, circular cavity resonator – Q factor of cavity resonator for TE<sub>101</sub> mode - Numerical problems.

**TUTORIAL 15**

**TOTAL: 60**

**TEXT BOOKS**

1. J.D.Ryder “Networks, Lines and Fields”, PHI, New Delhi, 2003. (Unit I & II)
2. E.C. Jordan and K.G.Balmain “Electro Magnetic Waves and Radiating System, PHI, New Delhi, 2003. (Unit III, IV & V)

**REFERENCES**

1. Ramo, Whineery and Van Duzer: “Fields and Waves in Communication Electronics” John Wiley, 2003.
2. David M.Pozar: Microwave Engineering – 2<sup>nd</sup> Edition – John Wiley.
3. David K.Cheng,Field and Waves in Electromagnetism, Pearson

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**19148S31BP**

**SEMESTER III**

**PROBABILITY AND RANDOM PROCESSES**

(Common to ECE & BM)

**3 1 0 4**

**AIM**

This course aims at providing the necessary basic concepts in random processes. A knowledge of fundamentals and applications of phenomena will greatly help in the understanding of topics such as estimation and detection, pattern recognition, voice and image processing networking and queuing.

**OBJECTIVES**

At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well – founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand and characterize phenomena which evolve with respect to time in probabilistic manner.
- Be able to analyze the response of random inputs to linear time invariant systems.

**UNIT I PROBABILITY AND RANDOM VARIABLE 9**

Axioms of probability - Conditional probability - Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

**UNIT II STANDARD DISTRIBUTIONS 9**

Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions and their properties - Functions of a random variable (excluding theorem).

**UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9**

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression (for distributions only) - Transformation of random variables - Central limit theorem.

**UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9**

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT V CORRELATION AND SPECTRAL DENSITIES 9**

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Relationship between cross power spectrum and cross correlation function – Auto correlation and cross correlation functions of input and output.

**TUTORIAL 15**

**TOTAL : 60**

**TEXT BOOKS**

1. Ross, S., “A First Course in Probability”, Fifth edition, Pearson Education, Delhi, 2002.
2. Peebles Jr. P.Z., “Probability Random Variables and Random Signal Principles”, Tata McGraw-Hill Publishers, Fourth Edition, New Delhi, 2002. (Chapters 6, 7 and 8).

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**MICROPROCESSOR, INTERFACING AND APPLICATIONS****3 1 0 4****AIM**

To learn the architecture programming ,interfacing and applications of microprocessors.

**OBJECTIVES**

- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture and programming of 8086 microprocessor.
- To introduce the applications, programming with 8085 microprocessor.

**UNIT I 8085 CPU 9**

8085 Architecture – Instruction set – Addressing modes — Assembly language programming – Interrupts – Memory interfacing – Interfacing, I/O devices.

**UNIT II PERIPHERALS INTERFACING 9**

Interfacing Serial I/O (8251) - parallel I/O (8255) –Keyboard and Display controller (8279) – ADC/DAC interfacing

**UNIT III 8086 CPU 9**

Intel 8086 Internal Architecture – 8086 Addressing modes- Instruction set- 8086 Assembly language Programming–Interrupts.

**UNIT IV 8086 SYSTEM DESIGN 9**

8086 signals and timing – MIN/MAX mode of operation – Addressing memory and I/O – Multiprocessor configurations – System design using 8086

**UNIT V 8085 APPLICATIONS 9**

Stepper motor control – DC motor control –Traffic light control —Digital Clock – Square wave generation

**TUTORIAL 15****TOTAL : 60****TEXT BOOKS**

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4<sup>th</sup> 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.

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

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, 2<sup>nd</sup> 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



**DIGITAL SIGNAL PROCESSING****3 1 0 4****AIM**

To study the signal processing methods and processors.

**OBJECTIVES**

- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

**UNIT I FAST FOURIER TRANSFORM 9**

Discrete Time Fourier Transform (DTFT), Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms

**UNIT II IIR FILTER DESIGN 9**

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

**UNIT III FIR FILTER DESIGN 9**

Symmetric & Antisymmetric FIR filters – Linear phase filter – Windowing technique – Rectangular, Hamming– Frequency sampling techniques

**UNIT IV FINITE WORD LENGTH EFFECTS 9**

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling

**UNIT V POWER SPECTRUM ESTIMATION 9**

Computation of Energy density spectrum – auto correlation and power spectrum of random signals. Periodogram – use of DFT in power spectrum estimation – Non parametric methods for power spectral estimation: Bartlett methods –Application of DSP – Model of Speech Wave Form – Vocoder.

**TUTORIAL 15****TOTAL : 60****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

### **TEXT BOOK**

1. John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education, 2000, 3<sup>rd</sup> Edition.

### **REFERENCES**

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2000, 2<sup>nd</sup> Edition.
2. Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2002.
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill, 2001, Second Edition.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## COMMUNICATION THEORY

3 1 0 4

**AIM**

To study the various analog communication fundamentals viz., Amplitude modulation and demodulation, angle modulation and demodulation. Noise performance of various receivers and information theory with source coding theorem are also dealt.

**OBJECTIVE**

- To provide various Amplitude modulation and demodulation systems.
- To provide various Angle modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

**UNIT I AMPLITUDE MODULATION SYSTEMS 10**

Review of spectral characteristics of periodic and non-periodic signals – Generation and demodulation of AM, DSBSC, SSB and VSB signals – Comparison of amplitude modulation systems – Frequency translation – FDM – Non-linear distortion.

**UNIT II ANGLE MODULATION SYSTEMS 8**

Phase and frequency modulation – Single tone – Narrow band and wideband FM – Transmission bandwidth – Generation and demodulation of FM signal.

**UNIT III NOISE THEORY 8**

Review of probability – Random variables and random process – Gaussian process – Noise – Shot noise – Thermal noise and white noise – Narrow band noise – Noise temperature – Noise figure.

**UNIT IV PERFORMANCE OF CW MODULATION SYSTEMS 10**

Superheterodyne radio receiver and its characteristic – SNR – Noise in DSBSC systems using coherent detection – Noise in AM system using envelope detection FM system – FM threshold effect – Pre-emphasis and de-emphasis in FM – Comparison of performances.

**UNIT V INFORMATION THEORY 9**

Discrete messages and information content – Concept of amount of information – Average information – Entropy – Information rate – Source coding to increase average information per bit – Shannon-fano coding – Huffman coding – Lempel-Ziv (LZ) coding – Shannon's theorem – Channel capacity – Bandwidth – S/N trade-off – Mutual information and channel capacity – Rate distortion theory – Lossy source coding.

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

**TUTORIAL 15**

**TOTAL : 60**

**TEXT BOOKS**

1. Dennis Roddy and John Coolen., “Electronic Communication”, 4th Edition, PHI,1995.
2. Herbert Taub and Donald L Schilling., “Principles of Communication Systems”, 3rd Edition, TMH, 2008.

**REFERENCES**

1. Simon Haykin., “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
2. Bruce Carlson., “Communication Systems”, 3rd Edition, TMH, 1996.
3. Lathi, B. P., “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford Press, 2007.
4. John G. Proakis, Masoud Salehi., “Fundamentals of Communication Systems”, 5th Edition, Pearson Education, 2006.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**DIGITAL SIGNAL PROCESSING AND MICRO PROCESSOR LAB**

0032

**PART-I DSP LAB****Using Processor & MATLAB:**

1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display
3. Implementation of FIR filter
4. Calculation of FFT
5. Linear & Circular Convolution

**PART-II MICROPROCESSOR LAB**

1. Programs for 8/16 bit Arithmetic operations (Using 8085).
2. Programs for Sorting and Searching (Using 8085, 8086).
3. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
4. Interfacing and Programming 8253
5. Serial Communication between two MP Kits using 8251.
6. Interfacing and Programming of Stepper Motor and DC Motor Speed control

**DIGITAL COMMUNICATION****3 1 0 4****AIM**

To introduce the basic concepts of Digital Communication modulation to baseband, passband modulation and to give an exposure to error control coding and finally to discuss about the spread spectrum modulation schemes.

**OBJECTIVES**

- To study pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To learn baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

**UNIT I: Digital communication Introduction and Pulse modulation 9**

Block Diagram of digital communication systems Advantages, Disadvantages, Sampling, Aliasing, Pulse Amplitude Modulation, Pulse Duration and Pulse position Modulation, Pulse Coded Modulation, Delta Modulation, TDM

**UNIT II: Baseband Pulse Transmission 9**

Matched Filters , Intersymbol Interference , Nyquist Pulse Shaping, M-ary PAM Transmission Linear Equalizers , Adaptive Equalizers

**UNIT III: Digital Bandpass Transmission 9**

Representations of Bandpass Signals and Systems Correlation, Signal-space representations ,Detection of Known Signals in AWGN , Generation ,detection, spectra, applications, signal space diagram of FSK, PSK, MSK

**UNIT IV: Spread Spectrum Communications 9**

Advantages, characteristic of Spread Spectrum Communication. Direct Sequence spread spectrum systems, Frequency Hopping spread spectrum communication, Pseudo Noise sequences: Types and Characteristics, code-division multiplexing (CDM). Application to CDMA wireless communication systems

**UNIT V: Error Control coding 9**

Linear block codes, convolutional codes, Hamming codes

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

## TUTORIAL 15

TOTAL: 60

### Textbook:

1. S. Haykin, *Communication Systems*, Fourth Edition, Wiley, 2001.

### Reference:

1. L.W. Couch II, *Digital and Analog Communication Systems*, Sixth Edition, Prentice-Hall, 2001.
2. B.P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 1998. TK5101.L333
3. John Proakis "Digital Communications" , McGraw-Hill Science/Engineering/Math; 4 edition 2000

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

**ANTENNA AND WAVE PROPAGATION****3 1 0 4****AIM**

To enable the student to study the various types of antennas and wave propagation.

**OBJECTIVES**

- To study radiation from a current element.
- To study antenna arrays
- To study aperture antennas
- To learn special antennas such as frequency independent and broad band antennas.
- To study radio wave propagation.

**UNIT I : RADIATION 9**

Concept of Vector potentials- Modification for Time varying , retarded case- Fields and radiation resistance of an alternating current element- -Radiation resistance –Effective length – Radiation intensity-Gain and Directivity-Field patterns- Beamwidth – Effective area-Relation between gain, effective length and radiation resistance.

**UNIT II: ANTENNA ARRAYS 9**

Arrays of two point sources- Broadside array and End fire arrays – Binomial arrays - Pattern multiplication- Uniform linear array-

**UNIT III : SPECIAL PURPOSE ANTENNAS 9**

Radiation from traveling wave on wire- Rhombic antenna – Loop antennas- Three element Yagi antenna- Log periodic antenna- Horn antenna -

**UNIT IV: PROPAGATION 9**

Ground wave propagation: Attenuation characteristics – Calculation of field strength – Sky wave Propagation: Structure of Ionosphere – Effective dielectric constant of ionized region-Mechanism of Refraction and Refractive index- Critical Frequency- Skip distance- Maximum usable frequency –Fading and Diversity Techniques.

Space Wave Propagation: Calculation of Field strength –Duct propagation.

**UNIT V : MEASUREMENTS 9**

Impedance – Field Pattern and Gain of Antennas- Radiation Pattern –Ionospheric measurements-Vertical incidence measurements of the ionosphere- Relation between oblique and vertical incidence transmission.

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



**TUTORIAL 15**

**TOTAL: 60**

**Text Books:**

1. EDWARD C.JORDAN- Electromagnetic waves and Radiation systems – Asia Publication House, PHI, 1978, Reprint 2003.

**Reference Books:**

1. Jhon .D. Kraus and Ronalatory Marhefka- Antenna-T McGraw Hill – 2002
2. R.E.Collins-Antennas and Radio Propagation- McGrawhill- 1987
3. Ballany – Antenna Theory- Jhon wiley & sons – 2<sup>nd</sup> edition 2003.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**COMPUTER NETWORKS****4 0 0 4****AIM**

To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

**OBJECTIVES**

- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

**UNIT I DATA COMMUNICATIONS 8**

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 12**

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 techniques – HDLC.

LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

**UNIT III NETWORK LAYER 10**

Internetworks - Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

**UNIT IV TRANSPORT LAYER 8**

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 7**

Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

**TOTAL : 45****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

### **TEXT BOOKS**

1. Behrouz A. Foruzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.

### **REFERENCES**

1. James .F. Kurose & W. Rouse, “Computer Networking: A Topdown Approach Featuring”, Pearson Education.
2. Larry L.Peterson & Peter S. Davie, “COMPUTER NETWORKS”, Harcourt Asia Pvt. Ltd., Second Edition.
3. Andrew S. Tannenbaum, “Computer Networks”, PHI, Fourth Edition, 2003.
4. William Stallings, “Data and Computer Communication”, Sixth Edition, Pearson Education, 2000.

**Part I: NETWORKS**

1. PC to PC Communication  
Parallel Communication using 8 bit parallel cable  
Serial communication using RS 232C
2. Ethernet LAN protocol  
To create scenario and study the performance of CSMA/CD protocol ethrol simulation
3. Token bus and token ring protocols  
To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols  
To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol

**Part II: COMMUNICATION**

1. Modulation and Demodulation Characteristics of AM/FM Transmitter And Reciever.
2. Pulse modulation- PAM / PWM /PPM
3. Pulse code modulation
4. Digital modulation –ASK, PSK, QPSK, FSK
5. Experiments on Antenna:  
To plot and analyse the radiation patterns of the following antennas.  
Dipole  
Half Wave Dipole  
Monopole  
Yagi Antenna
6. Experiments on Coaxial Line Section:  
Measurement of VSWR  
Stub matching

**19152E44AP**

*ELECTIVE - I*  
**SEMESTER IV**

**HIGH SPEED NETWORKS**

**4 0 0 4**

**AIM**

To highlight the features of different technologies involved in High Speed Networking and their performance.

**OBJECTIVES**

- Students will get an introduction about ATM and Frame relay.
- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.

Students will be provided with different levels of quality of service (Q.S) to different applications.

**UNIT I HIGH SPEED NETWORKS 9**

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM Cell – ATM Service Categories – AAL.  
High Speed LANs: Fast Ethernet, Gigabit Ethernet, Wireless LANs: applications, requirements – Architecture of 802.11

**UNIT II LAN SWITCHING TECHNOLOGY 9**

Switching concepts, switch forwarding techniques, switch path control, LAN switching, cut through forwarding, store and forward, Virtual LANs

**UNIT III TCP AND ATM CONGESTION CONTROL 9**

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm — Performance of TCP over ATM.  
Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats,– GFR traffic management.

**UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 9**

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRfq, GPS, WFQ – Random Early Detection, Differentiated Services

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT V IP SWITCHING****9**

Addressing model, IP Switching types-flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting,

**TOTAL : 45****TEXT BOOK**

1. William Stallings, "HIGH SPEED 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

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

19152E44BP

*ELECTIVE - I*  
**SEMESTER IV**

**ADVANCED DIGITAL SIGNAL PROCESSING**

**4 0 0 4**

**AIM**

To introduce the student to advanced digital signal processing techniques.

**OBJECTIVES**

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To study multirate signal processing fundamentals.
- To study the analysis of speech signals.
- To introduce the student to wavelet transforms.

**UNIT I DISCRETE RANDOM SIGNAL PROCESSING**

Discrete Random Processes-, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram - Parameter estimation: Bias and consistency.

**UNIT II SPECTRUM ESTIMATION**

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method.

Parametric Methods - AR, MA, and ARMA model based spectral estimation.

**UNIT III LINEAR ESTIMATION AND PREDICTION**

Linear prediction- Forward and backward predictions, - Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter

**UNIT IV ADAPTIVE FILTERS**

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

**UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING**

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

for sampling rate conversion- Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

**REFERENCES:**

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al., 'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al., 'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



19152E44CP

ELECTIVE - I  
SEMESTER IV

**SPEECH PROCESSING**

**4 0 0 4**

**AIM**

To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech analysis and speech compression

**OBJECTIVE**

- To introduce the models for speech production
- To develop time and frequency domain techniques for estimating speech parameters
- To introduce a predictive technique for speech compression
- To understand speech recognition, synthesis and speaker identification.

**UNIT I: NATURE OF SPEECH SIGNAL 9**

Speech production mechanism – Classification of speech – Sounds – Nature of speech signal – Models of speech production

**Speech Signal Processing:** Purpose of speech processing – Digital models for speech signal – Digital processing of speech signals – Significance – Short time analysis.

**UNIT II: TIME DOMAIN METHODS FOR SPEECH PROCESSING 9**

Time domain parameters of speech – Methods for extracting the parameters – Zero crossings – Auto correlation function – Pitch estimation.

**UNIT III: FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9**

Short time fourier analysis – Filter bank analysis – Spectrographic analysis – Format extraction – Pitch extraction – Analysis – Synthesis systems.

**UNIT IV: LINEAR PREDICTIVE CODING OF SPEECH 9**

Formulation of linear prediction problem in time domain – Solution of normal equations – Interpretation of linear prediction in auto correlation and spectral domains.

**UNIT V: HOMOMORPHIC SPEECH ANALYSIS 9**

Central analysis of speech – Format and pitch estimation – Applications of speech processing – Speech recognition – Speech synthesis and speaker verification.

**Total: 45**

**TEXTBOOK**

1. Rabiner L.R. and Schafer R.E, “Digital Processing of Speech Signals”, Prentice Hall, 1978.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **REFERENCES**

1. Flanagan J.L, "Speech Analysis Synthesis and Perception", 2nd Edition, Springer Verlag, 1972.
2. Witten I.H., "Principles of Computer Speech", Academic Press, 1983.

19152E44DP

*ELECTIVE - I*  
**SEMESTER IV**

**FUZZY LOGIC AND NEURAL NETWORKS**

**4 0 0 4**

**AIM**

To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

**OBJECTIVES**

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

**UNIT I: Primer on Fuzzy Sets**

**9**

Crisp sets, from crisp sets to fuzzy sets , Linguistic variables ,Membership functions  
Some terminology , Set theoretic operations for crisp sets , Set theoretic operations for fuzzy sets , membership functions

**UNIT II: Fuzzy Logic Systems**

**9**

Introduction , Rules , Fuzzy Inference Engine , Fuzzification and Its Effect on Inference  
Fuzzifier , Fuzzy inference engine, Defuzzification, Centroid defuzzifier , Center-of-sums defuzzifier

**UNIT III: Neural Nets Introduction and Overview**

**9**

Perceptrons,Least Mean Square Learning Systems , Multilayer Neural Networks Back-  
Propagation The Practical Application of Back-Propagation  
Error Rate and Complexity Fit Estimation Improving on Standard Back-Propagation

**UNIT IV: Radial Basis Function Networks**

**9**

Ill-Posed Problems and the Regularization Technique , Stabilizers and Basis Functions,  
Generalized Radial Basis Function Networks, Moving Centers Learning, Regularization

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

with Nonradial Basis Functions, Orthogonal Least Squares, Optimal Subset Selection by Linear

**UNIT V: ANFIS: Adaptive Neuro-Fuzzy Inference Systems 9**

Introduction , ANFIS Architecture , Hybrid Learning Algorithm , Learning Methods that Cross-fertilize ANFIS and RBFN , ANFIS as a Universal Approximator

**TOTAL : 45**

**Textbook:**

1. Bart Kosko, Neural networks and fuzzy systems: a dynamical systems approach to machine intelligence, Prentice-Hall, Inc., Upper Saddle River, NJ, 1991

**Reference:**

1. Kin, S. (1999), Neural Networks: A Comprehensive Foundation, 2nd ed., Upper Saddle River, NJ: Prentice Hall, ISBN 0-13-273350-1.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani (1997) " Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, | Prentice Hall

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19152E44EP

*ELECTIVE - I*  
**SEMESTER IV**

**ADVANCED ELECTRONIC SYSTEM DESIGN 4 0 0 4**

**AIM**

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

**OBJECTIVE**

- To study RF component such as resonator, filter, transmission lines, etc...
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

**UNIT I: INTRODUCTION TO RF DESIGN 9**

RF behaviour of passive components – Chip components and circuit board considerations – Review of transmission lines – Impedance and admittance transformation – Parallel and series connection of networks – ABCD and scattering parameters – Analysis of amplifier using scattering parameter – RF filter – Basic resonator and filter configurations – Butterworth and chebyshev filters – Implementation of microstrip filter design – Band pass filter and cascading of band pass filter elements.

**UNIT II: RF TRANSISTOR AMPLIFIER DESIGN 9**

Impedance matching using discrete components – Microstrip line matching networks – Amplifier classes of operation and biasing networks – Amplifier power gain– Unilateral design( $S_{12}=0$ ) – Simple input and output matching networks – Bilateral design – Stability circle and conditional stability – Simultaneous conjugate matching for unconditionally stable transistors – Broadband amplifiers – High power amplifiers and multistage amplifiers.

**UNIT III: DESIGN OF POWER SUPPLIES 9**

DC power supply design using transistors and SCR's – Design of crowbar and foldback protection circuits – Switched Mode Power Supplies(SMPS) – Forward – Fly back-buck and boost converters – Design of transformers and control circuits for SMPS.

**UNIT IV: DESIGN OF DATA ACQUISITION SYSTEMS 9**

Amplification of low level signals – Grounding – Shielding and guarding techniques – Dual slope – Quad slope and high speed A/D converters – Microprocessors compatible

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

A/D converters – Multiplying A/D converters and logarithmic A/D converters – Sample and hold – Design of two and four wire transmitters.

**UNIT V: DESIGN OF PRINTED CIRCUIT BOARDS 9**

Introduction to technology of Printed Circuit Boards (PCB) – General lay out and rules and parameters – PCB design rules for digital – High frequency – Analog – Power electronics and microwave circuits – Computer Aided Design(CAD) of PCB's.

**Total: 45**

**TEXT BOOKS:**

1. Reinhold Luduig and Pavel Bretchko, “RF Circuit Design – Theory and Applications”, Pearson Education, 2000.
2. Sydney Soclof, “Applications of Analog Integrated Circuits”, PHI, 1990.
3. Walter C. Bosshart, “Printed Circuit Boards – Design and Technology”, TMH, 1983.

**REFERENCES**

1. Keith H. Billings, “Handbook of Switched Mode Supplies”, TMH Publishing Co., 1989.
2. Michael Jacob, “Applications and Design with Analog Integrated Circuits”, PHI, 1991.
3. Otmar Kigenstein, “Switched Mode Power Supplies in Practice”, John Wiley and Sons, 1989.
4. Muhammad H. Rashid, “Power Electronics – Circuits, Devices and Applications”,

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OPTICAL COMMUNICATION AND NETWORKS****4 0 0 4****AIM**

- To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- To study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.

**OBJECTIVES**

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

**UNIT I INTRODUCTION TO OPTICAL FIBERS 9**

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –fiber types Mode theory of Circular Wave guides- Overview of Modes- Key model concepts- Linearly Polarized Modes – Single Mode Fibers-

**UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9**

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination – Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers -Mode Coupling

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

**UNIT III FIBER OPTICAL SOURCES AND COUPLING 9**

Direct and indirect Band gap materials-LED structures –Quantum efficiency Modulation of a LED, lasers Diodes-Modes and Threshold condition Fiber amplifiers- Power Fibre – to- Fibre joints, Fibre splicing.

**UNIT IV FIBER OPTICAL RECEIVERS 9**

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error

**UNIT V DIGITAL TRANSMISSION SYSTEM 9**

Point-to-Point links System considerations –Link Power budget –Rise - time budget – Noise Effects on System Performance-Operational Principles of WDM, Solitons-. Basic on concepts of SONET/SDH Network.

**TOTAL : 45**

**TEXT BOOK**

1. Gerd Keiser, “Optical Fiber Communication” McGraw –Hill International, Singapore, 3<sup>rd</sup> ed., 2000

**REFERENCES**

1. J.Senior, “Optical Communication, Principles and Practice”, Prentice Hall of India, 1994.
2. J.Gower, “Optical Communication System”, Prentice Hall of India, 2001.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



**MICROWAVE ENGINEERING****4 0 0 4****Aim**

To enable the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.

**Objectives**

- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

**Unit – I: Introduction****9**

Radio Spectrum – Microwave Frequency and its characteristics – Transmission media for microwave signals – Waveguides – Scattering Parameters for microwave network (two ports)

**Unit – II: Passive Microwave Devices****9**

Isolators, Attenuators, Directional Couplers – Waveguide Tees – E- plane, H-Plane and Magic Tee – Matched Terminators – S – parameters for all the components

**Unit – III: Microwave Sources****9**

Klystron Oscillator – Magnetron Oscillator– TWTA Amplifier – Power output and efficiency equations for all the devices

**Unit – IV: Semiconductor Microwave Devices****9**

PIN Diode – Varactor Diode (Manley – Rowe Power Relation) – Tunnel Diode – Gunn Diode – Applications of all the diodes –

**Unit – V Microwave Measurements****9**

Power Measurements – Frequency Measurements – VSWR Measurements (High and Low VSWR) – Attenuation Measurements – Insertion Loss Measurements

**TOTAL : 45****Text Book:**

1. Samuel Y.LIAO : Microwave Devices and Circuits – Prentice Hall of India – 3<sup>rd</sup> Edition (2003)
2. Annapurna Das and Sisir K.Das: Microwave Engineering – Tata McGraw-Hill (2000) (UNIT V)

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

**Reference:**

1. R.E. Collin : Foundations for Microwave Engg. – IEEE Press Second Edition (2002)
2. David M.POZAR : Microwave Engg. – John Wiley & Sons – 2<sup>nd</sup> Edition (2003)
3. P.A.RIZZI – Microwave Engg. (Passive )

## VLSI DESIGN

3 1 0 4

**AIM**

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

**OBJECTIVES**

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

**UNIT I CMOS TECHNOLOGY 9**

An overview of Silicon semiconductor technology, Basic CMOS technology : nwell, P well, Twin tub and SOI Process. Interconnects, circuit elements: Resistors, capacitors, Electrically alterable ROMs, bipolar transistors, Latch up and prevention.

**UNIT II MOS TRANSISTOR THEORY 9**

NMOS, PMOS Enhancement transistor, Threshold voltage, Body effect, MOS DC equations, channel length modulation, Mobility variation, MOS models, small signal AC characteristics, complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time

**UNIT III SPECIFICATION USING VERILOG HDL 9**

Basic Concepts: VLSI Design flow, identifiers, gate primitives, value set, ports, gate delays, , Behavioral and RTL modeling: Operators, timing controls, Procedural assignments conditional statements, Data flow modeling and RTL. Structural gate level description of decoder, equality detector, comparator, priority encoder, D-latch, D-ff, half adder, Full adder, Ripple Carry adder.

**UNIT IV CMOS CHIP DESIGN 9**

Logic design with CMOS: MOSFETS as switches, Basic logic gates in CMOS, Complex logic gates, Transmission gates: Muxes and latches, CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channelless and structured GA, Programmable logic structures; 22V10, Programming of PALs, ASIC design flow.

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

**UNIT V CMOS TESTING 9**

**Need for testing, Design strategies for test, Chip level and system level test techniques.**

**TUTORIAL 15**

**TOTAL : 60**

**TEXT BOOKS**

1. Weste & Eshraghian: Principles of CMOS VLSI design (2/e) Addison Wesley, 1993 for UNIT I through UNIT IV.
2. Samir Palnitkar; Verilog HDL – Guide to Digital design and synthesis, III edition, Pearson Education, 2003 for UNIT V

**REFERENCES**

1. M.J.S.Smith : Application Specific integrated circuits, Pearson Education, 1997.
2. Wayne Wolf, Modern VLSI Design, Pearson Education 2003.
3. Bob Zeidmin ; Introduction to verilog, Prentice Hall, 1999
4. J . Bhaskar : Verilog HDL Primer, BSP, 2002.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## OPTICAL COMMUNICATION AND MICROWAVE LAB

0032

**Part I: Experiments pertaining to Fiber optics**

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibers – SM Fibers.
3. Coupling Fibers to Semi-Conductor Sources – Connectors & Splices.
4. Fiber optic communication links.
5. LED & Photo Diode Characteristics.

**Part II: Experiments pertaining to Microwave**

1. VSWR Measurements – Determination of terminated impedance
2. Determination of guide wavelength, frequency measurement.
3. Radiation Pattern of Horns, Paraboloids.
4. Microwave Power Measurement.
5. Characteristics of Gunn diode Oscillator.

**ENVIRONMENTAL SCIENCE AND ENGINEERING****4 0 0 4****UNIT:I INTRODUCTION TO ENVIRONMENTAL STUDIES AND  
NATURAL RESOURCES 9**

Definition, Scope and importance – Need for public awareness – Forest resources – Water resources – Energy resources – Land resources – Role of an individual in conservation of natural resources – Equitable use of resource for sustainable life styles.

**UNIT:II ECOSYSTEM AND BIODIVERSITY 9**

Concept of an ecosystem – structure and Function of An ecosystem - Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains Food web and ecological pyramids. Introduction to Biodiversity – Value 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 – Insitu and Excitu conservation of Biodiversity.

**UNIT:III ENVIRONMENTAL POLLUTION 9**

Definition – Causes, effects and control measure of : - Air pollution - Water Pollution - Soil Pollution - Marine Pollution - Noise Pollution - Thermal Pollution - Nuclear hazard – Solid Waste management – Role of Individual in prevention of pollution – Disaster management.

**UNIT:IV SOCIAL ISSUES AND THE ENVIRONMENT 9**

From Un sustainable to sustainable development – water conservation, Rain water harvesting, water shed Management – Global warming – Ozone layer Depletion – Acid rain – Nuclear Accidents and holocaust – Environment Protection Act, Issues involved in enforcement legislation.

**UNIT :V HUMAN POPULATION AND THE ENVIRONMENT 9**

Population growth – Population explosion – Family welfare programme – Environment and human health – Human rights – value education – HIV/AIDS– Role of Information Technology in Environment and human health.

**Total = 45****TEXT BOOK**

1. Gilbert M Masters, “ Introduction to Environmental Engineering and science, ”Second Edition , Pearson Education Pvt, Ltd, 2007.
2. Miller T.G.Jr. “ Environmental science, ”, Wadworth Publishing Co.

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

## **REFERENCES**

1. Kurian Joseph, "Essentials of Environmental studies", First edition, Pearson Education, 2004.
2. Bharucha Erach, "The Biodiversity of India ," Mapin Publishing Pvt,Ltd.

19152E54BP

*ELECTIVE- II*  
**SEMESTER V**

**OPTO ELECTRONIC DEVICES**

**4 0 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 learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

**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 – Injection luminescence – LED – Plasma display – Liquid Crystal Display (LCD) – 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



**UNIT V: OPTOELECTRONIC INTEGRATED CIRCUITS 9**

Introduction – Hybrid and monolithic integration – Application of opto electronic integrated circuits – Integrated transmitters and receivers – Guided wave devices.

**Total: 45**

**TEXTBOOK**

1. Wilson J and Haukes J., “Opto Electronics – An Introduction”, PHI Pvt. Ltd., 1995.

**REFERENCES**

1. Bhattacharya, “Semiconductor Opto Electronic Devices”, PHI Pvt Ltd., 1995.
2. Jasprit Singh, “Opto Electronics – As Introduction to Materials and Devices”, TMH International Edition, 1998.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**RADAR AND NAVIGATIONAL AIDS****4 0 0 4****AIM**

To make the student understand the principles of Radar and its use in military and civilian environment

Also to make the student familiar with navigational aids available for navigation of aircrafts and ships.

**OBJECTIVES**

- To derive and discuss the Range equation and the nature of detection.
- To apply doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore.

**UNIT I INTRODUCTION TO RADAR 9**

Basic radar – The simple form of the radar equation – Radar block diagram – Radar frequencies – Applications of radar – The origins of radar – The radar equation – Introduction – Detection of signals in noise – Receiver noise and the signal-to-noise ratio – Probability density functions – Probabilities of detection and false alarm – Integration of radar pulses – Radar cross section of targets – Radar cross section fluctuations – Transmitter power – Pulse repetition frequency – Antenna parameters – System losses – Other radar equation considerations

**UNIT II: MTI AND PULSE DOPPLER RADAR 9**

Introduction to Doppler and MTI radar – Delay-line cancellers – Staggered pulse repetition frequencies – Doppler filter banks – Digital MTI processing – Moving target detector – Limitations to MTI performance – MTI from a moving platform (AMIT) – Pulse Doppler radar – Other Doppler radar topics – Tracking with radar – Mono pulse tracking – Conical scan and sequential lobing – Limitations to tracking accuracy – Low – Angle tracking – Tracking in range – Other tracking radar topics – Comparison of trackers – Automatic tracking with surveillance radars (ADT).

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

**UNIT III****9**

Detection of signals in noise – Introduction – Matched – Filter receiver – Detection – Detectors – Automatic detector – Integrators – Constant – False – Alarm rate receivers – The radar operator – Signal management – Propagation radar waves – Atmospheric – Standard propagation – Nonstandard propagation – The radar antenna – Reflector antennas – Electronically steered phased array antennas – Phase shifters – Frequency – Scan arrays – Radar transmitters – Introduction – Linear beam power tubes – Solid state RF power sources – Magnetron – Crossed field amplifiers – Other RF power sources – Other aspects of radar transmitter – Radar receivers – The radar receiver – Receiver noise figure – Super heterodyne receiver – Duplexers and receiver protectors – Radar displays.

**UNIT IV****9**

Introduction – Four methods of navigation – Radio direction finding – The loop antenna – Loop input circuits – An aural null direction finder – The goniometer – Errors in direction finding – Adcock direction finders – Direction finding at very high frequencies – Automatic direction finders – The commutated aerial direction finder – Range and accuracy of direction finders – Radio ranges – The Lf/Mf four course radio range – Vhf omni directional range (Vor) – Vor receiving equipment – Range and accuracy of Vor – Recent developments – Hyperbolic systems of navigation (loran and decca) – Loran-A equipment – Range and precision of standard loran – Loran-C – The decca navigation system – Decca receivers – Range and accuracy of decca – The omega system

**UNIT V****9**

DME and TACAN – Distance measuring equipment – Operation of DME – TACAN – TACAN equipment – Aids to approach and landing – Instrument landing system – Ground controlled approach system – Microwave Landing System (MLS) – Doppler navigation – The Doppler effect – Beam configurations – Doppler frequency equations – Track stabilization – Doppler spectrum – Components of the Doppler navigation system – Doppler range equation – Accuracy of Doppler navigation systems – Inertial navigation – Principles of operation – Navigation over the earth – Components of an inertial navigation system – Earth co-ordinate mechanization – Strapped – Down systems – Accuracy of inertial navigation systems – Satellite navigation system – The transit system – Navstar Global Positioning System (GPS)

**Total: 45****TEXTBOOK**

1. Merrill I. Skolnik , “Introduction to Radar Systems”, 3rd Edition, TMH, 2003.

**REFERENCES**

1. Peyton Z. Peebles, “Radar Principles”, John wiley, 2004
2. Toomay J.C, “Principles of Radar”, 2nd Edition, PHI, 2004

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

19152E54DP

*ELECTIVE- II*  
SEMESTER V

**DIGITAL IMAGE PROCESSING**

**4 0 0 4**

**AIM**

To introduce the student to various image processing techniques.

**OBJECTIVES**

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.

**UNIT - I: DIGITAL IMAGE FUNDAMENTALS 9**

Elements of visual perception – Image sampling, Quantization – Basic relationship between pixels- monochrome vision model- color space model-convolution.

**UNIT – II IMAGE TRANSFORM 9**

Basic geometric transforms-Introduction to Fourier transform and DFT – properties of 2D Fourier transform – FFT- Separable image transforms – Walsh – Hadamard- Discrete cosine and Haar Transforms

**UNIT-III: IMAGE ENHANCEMENT AND RESTORATION TECHNIQUES 9**

Spatial domain methods- Basic gray level transformation-Histogram equalization-Spatial filtering-Laplacian filtering- Frequency Domain filters- homomorphic filtering-Model of image degradation/Restoration process- Noise models.

**UNIT IV:IMAGE COMPRESSION 9**

Lossless compression-: Variable length coding- LZW coding- -Predictive coding-DPCM. Lossy compression- Transform coding-- Image compression standards-JPEG,MPEG.

**UNIT – V:IMAGE SEGMENTATION & REPRESENTATION 9**

Edge detection – Thresholding- region based segmentation- Boundary representation – chain codes- Boundary segments – boundary descriptors-: simple descriptors-Fourier descriptors- Regional descriptors- Texture.

**TOTAL : 45**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**Text Book:**

1. Rafael C. Gonzalez, Richard E. Woods 2<sup>nd</sup> edition – Digital Image processing – Pearson education 2003.

**Reference books:**

1. William K. Pratt, Digital Image processing, John Wiley (2001)
2. Image processing Analysis and Machine Vision - Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/Colic, Thompson Larnfy(1999)
3. A.K.Jain PHI,(1995) – Fundamentals of Digital Image processing

19152E54EP

*ELECTIVE- II*  
**SEMESTER V**  
**4 0 0 4**

**ENGINEERING ACOUSTICS**

**AIM**

This course aims at providing an overview of engineering acoustics.

**OBJECTIVE**

- To provide mathematical basis for acoustics waves
- To introduce the concept of radiation reception absorption and attenuation of acoustic waves.
- To present the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To describe the architecture and environmental inclusive of reverberation and noise.
- To give a detailed study on loud speakers and microphones.

**UNIT I:**

Acoustics waves – Linear wave equation – Sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – Spherical waves – Describer scales.

**Reflection and Transmission:** Transmission from one fluid to another normal and oblique incidence – Method of images.

**UNIT II: RADIATION AND RECEPTION OF ACOUSTIC WAVES 9**

Radiation from pulsating sphere – Acoustic reciprocity – Continuous line source – Radiation impedance – Fundamental properties of transducers.

**Absorption and attenuation of sound:** Absorption from viscosity – Complex sound speed and absorption – Classical absorption co-efficient

**UNIT III: PIPE RESONATORS AND FILTERS 9**

Resonance in pipes – Standing wave pattern absorption of sound in pipes – Long wavelength limit – Helmholtz resonator – Acoustic impedance – Reflection and transmission of waves in pipe – Acoustic filters – Low pass, high pass and band pass.

**Noise, Signal detection, Hearing and speech:** Noise, spectrum level and band level – Combing band levels and tones – Detecting signals in noise – Detection threshold – The ear – Fundamental properties of hearing – Loudness level and loudness – Pitch and frequency – Voice.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT IV: ARCHITECTURAL ACOUSTICS 9**

Sound in enclosure – A simple model for the growth of sound in a room – Reverberation time – Sabine, sound absorption materials – Measurement of the acoustic output of sound sources in live rooms – Acoustics factor in architectural design.

**Environmental Acoustics:** Weighted sound levels speech interference – Highway noise Noise induced hearing loss – Noise and architectural design specification and measurement of some isolation design of portions.

**UNIT V: TRANSDUCTION 9**

Transducer as an electrical network – Canonical equation for the two simple transducers transmitters – Moving coil loud speaker – Loudspeaker cabinets – Horn loud speaker, receivers – Condenser – Microphone – Moving coil electrodynamic microphone Piezoelectric microphone – Calibration of receivers.

**Total: 45**

**TEXT BOOK**

1. Lawrence E. Kinsler, Austin R. Frey, Alan B. Coppens and James V. Sanders, “Fundamentals of Acoustics”, 4<sup>th</sup> Edition, Wiley, 2000.

**REFERENCE**

1. Berarek L., “Acoustics”, TMH, 2002.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**MOBILE AND WIRELESS COMMUNICATION****4 0 0 4****AIM**

To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

**Objectives**

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
- It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides idea about analog and digital modulation techniques used in wireless communication. It also deals with the different types of equalization techniques and diversity concepts.
- It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques are presented. This unit also describes the time, frequency code division multiple access techniques as well as more recent multiple access technique such as space division multiple access.
- It deals with second generation and third generation wireless networks and worldwide wireless standards.

**UNIT I: PRINCIPLES OF WIRELESS COMMUNICATION 10**

Digital modulation techniques – Linear modulation techniques – Spread spectrum modulation – Performance of modulation – Multiple access techniques – TDMA – FDMA – CDMA – SDMA – Overview of cellular networks – Cellular concept – Handoff strategies – Path loss – Fading and Doppler effect.

**UNIT II: WIRELESS PROTOCOLS 11**

Issues and challenges of wireless networks – Location management – Resource management – Routing – Power management – Security – Wireless media access

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



techniques – ALOHA – CSMA – Wireless LAN – MAN – IEEE 802.11 (a–b–e–f–g–h–i) – Bluetooth. Wireless routing protocols – Mobile IP – IPv4 – IPv6 – Wireless TCP. Protocols for 3G & 4G cellular networks – IMT – 2000 – UMTS – CDMA2000 – Mobility management and handover technologies – All-IP based cellular network

**UNIT III: TYPES OF WIRELESS NETWORKS 9**

Mobile networks – Ad-hoc networks – Ad-hoc routing – Sensor networks – Peer-Peer networks – Mobile routing protocols – DSR – AODV – Reactive routing – Location aided routing – Mobility models – Entity based – Group mobility – Random way – Point mobility model.

**UNIT IV: ISSUES AND CHALLENGES 9**

Issues and challenges of mobile networks – Security issues – Authentication in mobile applications – Privacy issues – Power management – Energy awareness computing. Mobile IP and Ad-hoc networks – VoIP applications.

**UNIT V: SIMULATION 6**

Study of various network simulators (GloMoSim – NS2 – Opnet) – Designing and evaluating the performance of various transport and routing protocols of mobile and wireless networks using network simulator (any one).

**Total: 45**

**REFERENCES**

1. Theodore S. Rappaport, “Wireless Communications, Principles and Practice”, Prentice Hall, 1996.
2. Stallings W., “Wireless Communications & Networks”, Prentice Hall, 2001.
3. Schiller J., “Mobile Communications”, Addison Wesley, 2000.
4. Lee W. C. Y., “Mobile Communications Engineering: Theory and Applications”, 2nd Edition, TMH, 1997.
4. Pahlavan K. and Krishnamurthy P., “Principles of Wireless Networks”, Prentice Hall, 2002.
5. Black U. D., “Mobile and Wireless Networks”, PHI, 1996.
6. Charles E. Perkins, “Ad – Hoc Networking”, Addison – Wesley, December 2000
7. IEEE Journals and Proceedings

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**MEDICAL ELECTRONICS****3 1 0 4****AIM**

To make students to understand the applications of electronics in diagnostic and therapeutic area.

**OBJECTIVE**

- To study the methods of recording various biopotentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

**UNIT I ELECTRO- PHYSIOLOGY AND BIO- POTENTIAL RECORDING 9**

The origin of bio-potentials – Bio-potential electrodes – Biological amplifiers – ECG – EEG – EMG – PCG – EOG – Lead systems and recording methods – Typical waveforms and signal characteristics.

**UNIT II BIO- CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9**

PH – PO<sub>2</sub> – PCO<sub>2</sub> – PHCO<sub>3</sub> – Electrophoresis – Colorimeter – Photometer – Auto analyzer – Blood flow meter – Cardiac output – Respiratory measurement – Blood pressure – Temperature – Pulse – Blood cell counters.

**UNIT III ASSIST DEVICES AND BIO- TELEMETRY 9**

Cardiac pacemakers – DC defibrillator – Telemetry principles – Frequency selection – Bio-telemetry – Radio – Pill and tele-stimulation.

**UNIT IV RADIOLOGICAL EQUIPMENTS 9**

Ionising radiation – Diagnostic X-ray equipments – Use of radio isotope in diagnosis – Radiation therapy.

**UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9**

Thermo graph – Endoscopy unit – Laser in medicine – Diathermy units – Electrical safety in medical equipment.

**TUTORIAL 15****TOTAL: 60****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

## **TEXTBOOK**

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", PHI, 2002.

## **REFERENCES**

1. Khandpur R.S., "Handbook of Biomedical Instrumentation", TATA McGraw-Hill, 1997.
2. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, 1997.

**MICRO CONTROLLER AND EMBEDDED SYSTEMS****3 1 0 4****Aim**

To make students familiar about microcontroller, programming and its applications.

**Objective**

- To study 8051 architecture
- To write assembly language programming
- To study the embedded architecture and real time applications.

**UNIT I 8051 MICROCONTROLLER 9**

8051 Micro controller hardware- I/O pins, ports and circuits- External memory –Counters and Timers-Serial Data I/O- Interrupts-

**UNIT II 8051 PROGRAMMING AND APPLICATIONS 9**

8051 instruction set – Addressing modes – Assembly language programming – I/O port programming -Timer and counter programming – Serial Communication – Interrupt programming –8051 Interfacing:, Stepper Motors.

**UNIT III 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)

**UNIT IV DEVICES AND BUSES FOR DEVICES NETWORK 9**

I/O Devices - Device I/O Types– Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices -Communication Devices - UART and HDLC - Parallel Port Devices - Timer and Counting Devices - ‘12C’, ‘CAN’ - I/O Serial high speed buses- ISA.

**UNIT V EMBEDDED ARCHITECTURE 9**

Embedded computers, characteristics of embedded, computing applications- challenges in embedded computing systems design, embedded design process, requirements and specifications, architectural design

**TUTORIAL 15****TOTAL : 60****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

### **TEXT BOOKS**

1. Ramesh S.Gaonkar, “Microprocessor - Architecture, Programming and Applications with the 8085”, Penram International publishing private limited, fifth edition.
2. A.K. Ray & K.M.Bhurchandi, “Advanced Microprocessors and peripherals-Architectures, Programming and Interfacing”, TMH, 2002 reprint.
3. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003

### **REFERENCES**

1. Douglas V.Hall, “Microprocessors and Interfacing: Programming and Hardware”, TMH, Third edition
2. Yu-cheng Liu, Glenn A.Gibson, “Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design”, PHI 2003
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, “The 8051 microcontroller and embedded systems”, Pearson education, 2004.
4. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
5. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
6. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001

**PART -I: VLSI LAB**

1. Study of Simulation using tools using Digital Logic Circuits.
2. Study of Synthesis tools using Digital Logic Circuits.
3. Study of development tool for FPGA using Verilog and Schematic Entry.
4. Design and Simulation of 8bit Signed Multiplier.
5. Place and Route and back annotation for FPGA.

**PART-II: EMBEDDED LAB**

1. Programming using Arithmetic, instruction of 8051 microcontroller.
2. Programming and verifying Timer operations in 8051 microcontroller.
3. ARM-7 based On board LED testing
4. ARM 7 Based ADC testing
5. ARM 7 based DAC testing

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*ELECTIVE -III*  
**SEMESTER VI**

**PRINCIPLES OF MANAGEMENT**

(Common to all Branches)

**4 0 0 4**

**UNIT I - Nature of Management 9**

Definitions, meaning, scope, administration and management - Science and art Mgmt as a profession, University of management Hierarchy (Top, middle and supervisory, Levels), Principles of Management

**UNIT II - Development of Management Thought 9**

Taylor and Scientific Management, Principles of Scientific Management Contributions of Fayol, Barnard and social system theory, Contributions of Herbert Simon, Contributions of Peter Drucker, Contributions of behavioral scientists, Contribution of system scientists

**UNIT III - Planning and organizing 9**

Definition and features of planning, Nature of planning, Importance of planning  
Types of planning, Steps in planning. Management by objectives, Strategies and policies, Definition of organization, Importance of organization, Principles of organization, Span of management

**UNIT IV - Direction and Coordination 9**

Meaning, definition, principles of direction, Techniques of direction - Meaning of supervision, Functions of supervisor, Meaning of coordination Element and features of coordination, Importance of coordination Cooperation and coordination systems approach Steps for effective coordination Meaning and causes of conflicts, Management of conflicts

**UNIT V – Controlling 9**

Definition, Meaning elements, steps in establishing control procedure Control Techniques, Requirements of good control systems Budget –meaning, definitions, types Zero based budgeting, responsibility accounting, budgetary control, Report –meaning types PERT and CPM Management by Exception

**TOTAL : 45**

**Textbooks:**

1. Prasad L.M., Principles and practice of Management, New Delhi Sultan Chand and sons, 1998

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**References:**

1. Saxena ,S.C principles and practice of management Agra : sahitya bhawan 1998
2. Koontz Harold and others ,Management New York :McGraw Hill 1980
3. Stoner James and others ,Management ,New Delhi :PHI ,1997
4. Dale Yoder : Personnel Management and industrial Relations ,New Delhi, PHI 1974



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*ELECTIVE -III*  
SEMESTER VI

**SATELLITE COMMUNICATION**

**4 0 0 4**

**AIM**

To enable the student to become familiar with satellites and satellite services.

**OBJECTIVES**

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

**UNIT I : ELEMENTS OF ORBITAL MECHANICS 9**

Equation of motion – Orbital elements – Orbital perturbation – Tracking and orbit determination – orbit control.

Satellite Launch systems: Fundamentals of Rocket propulsion – Multistage rockets – Huffman transfer orbit circularization

**UNIT II: ELEMETS OF COMMUNICATION SATELLITE DESIGN 9**

Space environment – Spacecraft configuration – Spacecraft subsystems – Payload – Reliability consideration – Spacecraft integration – Testing facilities – Spacecraft operations.

**UNIT – III : SATELLITE COMMUNICATION SYSTEMS 9**

Types of systems – FSS,BSS- Noise interference ,inter modulation –CDMA- Packet satellite networks – The INSAT system - The INTELSAT/INMARSAT system.

**UNIT – IV: EARTH STATION DESIGN 9**

Earth station configuration option – Site selection – Antenna systems – Tracking systems – Receiver subsystems – Low noise amplifiers – Down converters – Transmitter subsystems – Up converters- High power amplifiers - Terminal equipment .

**UNIT - V: PERFORMANCE MEASUREMENTS 9**

Spacecraft checkout – Ground station measurements –System coordination and control .Elements of Frequency coordination and management : The ITU/IFRB requirements – Satellite system characterization – Ground system characteristics .

**TOTAL : 45**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**Text book:**

1. B.N.AGARWAL :Deign of Geosynchronous spacecraft, Prentice Hall

**Reference Books:**

1. R.F.FILIPOWASKY and E.K.MUCHIDORF: Space communication Systems  
Mcgraw Hill
2. DENNIS RODDY – Satellite communication
3. K.MIYA :Satellite communication technology – Lattice and company

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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*ELECTIVE -III*  
**SEMESTER VI**

**ROBOTICS**

**4 0 0 4**

**AIM**

Robots are slowly and steadily replacing human beings in many fields. The aim of this course is to introduce the students into this area so that they could use the same when they enter the industries.

**OBJECTIVES**

- The course has been so designed to give the students an overall view of the mechanical components and mathematics associated with the same.
- Actuators and sensors necessary for the functioning of the robot.

**UNIT I: ROBOT ORGANIZATION 9**

Coordinate transformation, kinematics and inverse kinematics – Trajectory planning and remote manipulation.

**UNIT II: ROBOT HARDWARE 9**

Robot sensors – Proximity sensors – Range sensors – Visual sensors – Auditory sensors – Robot manipulators – Manipulator dynamics – Manipulator control – Wrists – End efforts – Robot grippers.

**UNIT III: ROBOT AND ARTIFICIAL INTELLIGENCE 9**

Principles of AI – Basics of learning – Planning movement – Basics of knowledge representations – Robot programming languages.

**UNIT IV: ROBOTIC VISION SYSTEMS 9**

Principles of edge detection – Determining optical flow and shape – Image segmentation – Pattern recognition – Model directed scene analysis.

**UNIT V: ROBOT CONTROL AND APPLICATION 9**

Robot control using voice and infrared – Overview of robot applications – Prosthetic devices – Robots in material handling, processing assembly and storage.

**Total: 45**

**REFERENCES**

1. Koren, “Robotics for Engineers”, TMH International Company, 1995.
2. Vokopravotic, “Introduction to Robotics”, Springer, 1988.
3. Rathmill K., “Robot Technology and Application”, Springer, 1985.
4. Charniak and Mc Darmott, “Introduction to Artificial Intelligence”, TMH, 1986.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

6. Fu K.S, Gonzally R.C, Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, TMH Book Company, 1997.
7. Barry Leatham and Jones, “Elements of Industrial Robotics”, Pittman Publishing, 1987.
8. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, “Industrial Robotic Technology Programming and Applications”, TMH Book Company, 1986.
9. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloguing Publication, 1990.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19152E64DP

*ELECTIVE -III*  
SEMESTER VI

**REMOTE SENSING**

**4 0 0 4**

**AIM:**

To understand the basics for remote sensing.

**OBJECTIVES:**

- Introduce the principles of remote sensing and fundamental knowledge on the physics of remote sensing, aerial photographic techniques, photogrammetry, multispectral, hyperspectral and thermal imaging, and RADAR and LIDAR image analysis.
- The newest technology in the field will also be discussed.
- The course will be taught with an emphasis on the geographical applications of remote sensing; however, in certain instances other disciplines will be introduced as well.

**UNIT I : REMOTE SENSING 9**

Definition – Components of Remote Sensing - Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation – Planck’s law – Stefan-Boltzman law.

**UNIT II: EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9**

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Material – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces – Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface: Imaging spectrometry and spectral characteristics.

**UNIT – III : OPTICAL AND MICROWAVE REMOTE SENSING 9**

Satellites – Classification – Based on Orbits and purpose – Satellite Sensors – Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Land sat, SPOT, IRS series – Current Satellites – Radar

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

Speckle – Back Scattering – Side Looking Airborne Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

**UNIT – IV: GEOGRAPHIC INFORMATION SYSTEM 9**

GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection – Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparison of Raster and Vector data structure – Analysis using Raster and Vector data – Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

**UNIT - V: MISCELLANEOUS TOPICS 9**

Visual Interpretation of Satellite Images – Elements of Interpretation – Interpretation Keys Characteristics of Digital Satellite Image – Image enhancement – Filtering – Classification – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – an introduction.

**TOTAL : 45 PERIODS**

**TEXT BOOK:**

1. M.G. Srinivas(Edited By), Remote Sensing Applications, Narosa Publishing House, 2001. (Units 1& 2).
2. Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications, 2001 (Units 3, 4, & 5).

**REFERENCE BOOKS:**

1. Jensen, J.R., Remote Sensing of the environment, Prentice Hall, 2000.
2. Kang-Tsung Chang, “Introduction to Geographic Information Systems” , TMH, 2002.
3. Lillesand T.M. and Kiefer R.W., “Remote Sensing and Image Interpretation”, John Wiley and Sons, Inc, New York, 1987.
4. Burrough P A, “Priciples of GIS for land resource assessment”, Oxford.
5. Mischael Hord, “Remote Sensing and Methods and Applications” , John Wiley & Sons, New York, 1986.
6. Signal, “Remote Sensing”, Tata McGraw-Hill, NewDelhi, 1990.
7. Floyd F. Sabins, Remote Sensing, “Priciples and interpretation”, W H Freeman and Company 1996.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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***ELECTIVE -III***  
**SEMESTER VI**

**NETWORK SECURITY**

**4 0 0 4**

**AIM**

To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

**OBJECTIVES**

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory
- To understand authentication and Hash functions
- To know the network security tools and applications.
- To understand the system level security used.

**UNIT I: SYMMETRIC CIPHERS 9**

Overview – Classical encryption techniques – Block ciphers and data encryption standard – Finite fields – Advanced encryption standard – Contemporary symmetric ciphers – Confidentiality using symmetric encryption.

**UNIT II: PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9**

Number theory – Public-key cryptography and RSA – Keym – Diffie-hellman key exchange – Elliptic curve cryptography – Message authentication and hash functions – Hash algorithms – Digital signatures and authentication protocols.

**UNIT III: NETWORK SECURITY PRACTICE 9**

Authentication applications – Kerberos-X.509 authentication service – Electronic mail security – Pretty good privacy – S/MIME – IP security – IP security architecture – Authentication header – Encapsulating security payload – Key management.

**UNIT IV: SYSTEM SECURITY 9**

Intruders – Intrusion detection – Password management – Malicious software – Firewalls – Firewall design principles – Trusted systems.

**UNIT V: WIRELESS SECURITY 9**

Wireless LAN security standards – Wireless LAN security factors and issues.

**Total: 45**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

### **TEXT BOOK**

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, 3rd Edition, Pearson Education, 2003.

### **REFERENCES**

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, TMH, 2007.
2. Bruce Schneier, “Applied Cryptography”, 2nd Edition, John Wiley and Sons Inc, 2001.
3. Stewart S. Miller, “Wi-Fi Security”, TMH, 2003.
4. Charles B. Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, 3<sup>rd</sup> Edition, Pearson Education, 2003.



**TOTAL QUALITY MANAGEMENT****3 0 0 3****OBJECTIVE**

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

**1. INTRODUCTION 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.

**2. 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.

**3. 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.

**4. TQM TOOLS 9**

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.

**5. 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.

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

**TOTAL : 45**

**TEXT BOOK**

1. Dale H.Besterfield, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

**REFERENCES**

1. James R.Evans & William M.Lindsay, The Management and Control of Quality, (5<sup>th</sup> Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw-Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth – Heinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**WIRELESS NETWORKS****3 1 0 4****AIM**

To study some fundamental concepts in wireless networks.

**OBJECTIVES**

- To understand physical as wireless MAC layer alternatives techniques.
- To learn planning and operation of wireless networks.
- To study various wireless LAN and WAN concepts.
- To understand WPAN and geo-location systems.

**UNIT I: PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES 9**

**Wired transmission techniques:** Design of wireless modems – Power efficiency – Out of band radiation – Applied wireless transmission techniques – Short distance base band transmission – VWB pulse transmission – Broad modems for higher speeds – Diversity and smart receiving techniques – Random access for data oriented networks – Integration of voice and data traffic.

**UNIT II: WIRELESS NETWORK PLANNING AND OPERATION 9**

Wireless networks topologies – Cellular topology – Cell fundamentals signal to interference ratio calculation – Capacity expansion techniques – Cell splitting – Use of directional antennas for cell sectoring – Micro cell method – Overload cells – Channels allocation techniques and capacity expansion FCA – Channel borrowing techniques – DCA – Mobility management – Radio resources and power management securities in wireless networks.

**UNIT III: WIRELESS WAN 9**

Mechanism to support a mobile environment – Communication in the infrastructure – IS-95 CDMA forward channel – IS-95 CDMA reverse channel – Pallert and frame formats in IS-95, IMT-2000 – Forward channel in W-CDMA and CDMA-2000 – Reverse channels in W-CDMA and CDMA-2000 – GPRS and higher data rates – Short Messaging Service in GPRS mobile application protocols.

**UNIT IV: WIRELESS LAN 9**

Historical overviews of the LAN industry – Evolution of the WLAN industry – Wireless Home Networking – IEEE 802.11 – The PHY layer – MAC layer – Wireless ATM – HYPER LAN – HYPER LAN – 2.

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

**UNIT V: WPAN AND GEOLOCATION SYSTEMS 9**

**IEEE 802.15 WPAN – Home RF – Bluetooth – Interface between Bluetooth and 802.11**

**– Wireless geolocation technologies for wireless geolocation – Geolocation standards for E.911 service.**

**Tutorial:15**

**Total: 60**

**TEXT BOOK**

1. Kaveh Pahlavan, Prashant Krishnamoorthy, “Principles of Wireless Networks, – A United Approach”, Pearson Education, 2002.

**REFERENCES**

1. Jochen Schiller, “Mobile Communications”, 2nd Edition, Person Education, 2003.
2. Wang X. and Poor H.V., “Wireless Communication Systems”, Pearson Education, 2004.
3. Mallick M., “Mobile and Wireless Design Essentials”, Wiley Publishing Inc. 2003.
4. Nicopolitidis P, Obaidat M.S, Papadimitria G.I, Pomportsis A.S., “Wireless Networks”, John Wiley and Sons, 2003.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**TELECOMMUNICATION SWITCHING AND NETWORKS****4 0 0 4****AIM**

- To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.
- To introduce a mathematical model for the analysis of telecommunication traffic.

**OBJECTIVES**

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

**UNIT I      EVOLUTION OF TELECOMMUNICATION SWITCHING AND CIRCUITS      9**

Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange, – Basic Tele communication equipments – Telephone handset, , Echo suppressors and cancellors, PCM coders, Modems and Relays.

**UNIT II      ELECTRONIC SWITCHING      9**

Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Space switching – Digital switching system hardware configuration,

**UNIT III      TELECOMMUNICATION SIGNALLING AND TRAFFIC      9**

Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, Grade of service, Modeling switching systems, Blocking models and Delay systems.

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

**UNIT IV INTEGRATED DIGITAL NETWORKS 9**

Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Synchronous, Asynchronous, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN)

**UNIT V DATA NET WORKS 9**

Data transmission in PSTN – Connection oriented and Connection less protocols – packet switching – ISO-OSI architecture-Satellite based data networks –LAN, WAN – standards – TCP / IP – Internet

**TOTAL : 45**

**TEXT BOOKS:**

1. Viswanathan. T, “Telecommunication Switching System and Networks”, Prentice Hall of India Ltd., 1994.
2. Behrouz Forouzan, “Introduction to Data Communication and Networking”, McGraw-Hill, 1998.

**REFERENCES**

1. L.S.Lawton, “Integrated Digital Networks, Galgotta Publication Pvt., Ltd., New Delhi,1996.
2. Syed R. Ali, “Digital Switching Systems”, McGraw-Hill Inc., New York, 1998.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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*ELECTIVE – IV*  
**SEMESTER VII**

**POWER ELECTRONICS**

**3 0 0 3**

**AIM**

Application of Electronic knowledge in industry for rectification of polyphase supply voltage and for control of motor speed and for thermal heating.

**OBJECTIVES**

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

**UNIT I POWER SEMICONDUCTOR DEVICES 9**

Power transistors, Thyristors, Power TRIAC, MOSFET, IGBT, GTO characteristics, rating, Protection circuits.

**UNIT II POWER SUPPLIES 9**

Single Phase and Three Phase Controlled rectifiers, Design of Trigger circuits, Switching mode regulators – Boost, Buck, Buck-Boost and Cuk regulators, AC voltage regulator.

**UNIT III INVERTERS 9**

Voltage and current source inverters, Resonant, Series inverter, PWM inverter.

**UNIT IV CHOPPERS 9**

Type A, B, C and D choppers, Pulse width modulation - Gating requirements.

**UNIT V MOTOR CONTROL & Applications 9**

Single Phase DC series motor drives, Induction and Synchronous motor drives, Switched reluctance motor Drive, SMPS and UPS

**TOTAL: 45**

**TEXT BOOK:**

1. M.D.Singh, K.B. Khanchandani, “Power Electronics”, Tata McGraw-Hill, 1998.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**REFERENCES:**

1. Ned Mohan, Tore M.Undeland, William P.Robbins, “Power Electronics, Converters, Applications and Design”, John Wiley & Sons, 1994.
2. Muhamed H.Roshid, “Power Electronics Circuits, Devices and Application”, Prentice Hall of India, 1995.
3. B.K.Bose, “Modern Power Electronics”, Jaico Publishing House, 1999.
4. Sen, Power Electronics”, Tata McGraw-Hill, 1987



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*ELECTIVE – IV*  
**SEMESTER VII**

**ADVANCED MICROPROCESSORS**

**3 0 0 3**

**AIM**

To learn the architecture and programming of advanced Intel family microprocessors and microcontrollers.

**OBJECTIVES**

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

**UNIT I      ADVANCED MICROPROCESSOR ARCHITECTURE      9**

Internal microprocessor architecture – Real mode memory addressing – Protected mode memory addressing – Memory paging – Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions – Arithmetic and logic instructions.

**UNIT II      MODULAR PROGRAMMING AND ITS CONCEPTS      9**

Modular programming – Using keyboard and video display – Data conversions – Disk files – Interrupt hooks – Using assembly languages with C/ C++

**UNIT III      PENTIUM PROCESSORS      9**

Introduction to pentium microprocessor – Special pentium registers – Pentium memory management – New pentium instructions – Pentium processor – Special pentium pro features – Pentium IV processor

**UNIT IV      16– BIT MICRO CONTROLLER      9**

8096/8097 architecture – CPU registers – RALU – Internal program and data memory timers – High speed input and output – Serial interface – I/O ports – Interrupts – A/D converter – Watch dog timer – Power down feature – Instruction set – External memory interfacing – External I/O interfacing.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **UNIT V RISC PROCESSORS AND ARM 9**

The RISC revolution – Characteristics of RISC architecture – The Berkeley RISC – Register windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – ARM processors – ARM registers – ARM instructions – ARM built-in shift mechanism – ARM branch instructions – Sequence control – Data movement and memory reference instructions.

**TOTAL: 45**

### **TEXT BOOKS**

1. Barry B. Brey, “The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386, 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing”, PHI Private Limited, 2003.
2. John Peatman, “Design with Microcontroller”, TMH Publishing Co Ltd, 2003.
3. Alan Clements, “The Principles of Computer Hardware”, 3rd Edition, Oxford University Press, 2003.

### **REFERENCES**

1. Rajkamal, “The Concepts and Feature of Micro Controllers 68HC11, 8051 and 8096”, S Chand Publishers, 2000.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY****3 0 0 3****AIM**

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

**OBJECTIVES**

- To understand EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards

**UNIT I BASIC CONCEPTS 9**

Definition of EMI and EMC with examples – Classification of EMI/EMC – CE – RE – CS – RS – Units of parameters – Sources of EMI – EMI coupling modes – CM and DM – ESD phenomena and effects – Transient phenomena and suppression.

**UNIT II EMI MEASUREMENTS 9**

Basic principles of RE, CE, RS and CS measurements – EMI measuring instruments – Antennas – LISN – Feed through capacitor – Current probe – EMC analyzer and detection technique open area site – Shielded anechoic chamber – TEM cell.

**UNIT III EMC STANDARD AND REGULATIONS 8**

National and international standardizing organizations – FCC – CISPR – ANSI – DOD – IEC – CENELEC – FCC – CE and RE standards – CISPR – CE and RE standards – IEC/EN – CS standards – Frequency assignment – Spectrum conversion.

**UNIT IV EMI CONTROL METHODS AND FIXES 10**

Shielding – Grounding – Bonding – Filtering – EMI gasket – Isolation transformer – Opto-isolator.

**UNIT V EMC DESIGN AND INTERCONNECTION TECHNIQUES 9**

Cable routing and connection – Component selection and mounting – PCB design – Trace routing – Impedance control – Decoupling – Zoning and grounding

**TOTAL: 45****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

### **TEXT BOOKS**

1. Prasad Kodali V., “Engineering Electromagnetic Compatibility”, S. Chand and Co, 2000.
2. Clayton R. Paul, “Introduction to Electromagnetic Compatibility” , Wiley and Sons, 1992.

### **REFERENCES**

1. Keiser, “Principles of Electromagnetic Compatibility”, 3rd Edition, Artech House, 1994.
2. Donwhite Consultant Incorporate , “Handbook Of EMI / EMC” , Vol I , 1985

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*ELECTIVE – IV*  
**SEMESTER VII**

**SOLID STATE ELECTRONIC DRIVES**

**3 0 0 3**

**AIM**

To have fundamental knowledge about structure of devices, VI characteristics of devices like PN Junction diode, Zener diode, MOSFET, BJT and Opto electronic.

**OBJECTIVES:**

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions. Fabrication of different semiconductor devices, Varactor diode, Zener diode, Schottky diode, BJT, MOSFET, etc.
- To study the VI Characteristics of devices and their limitations in factors like current, power frequency.
- To learn photoelectric effect and fabrication of opto electronic devices.

**UNIT I: CRYSTAL PROPERTIES AND GROWTH SEMICONDUCTORS 9**

Semiconductor materials – periodic Structures – Crystal Lattices – Cubic lattices – Planes and Directions – Diamond lattice – Bulk Crystal Growth – Starting Material – Growth of Single Crystal Ingots – Wafers – Doping – Epitaxial Growth – Lattice Matching in Epitaxial Growth – Vapor – Phase Epitaxy – Atoms and Electronics – Introduction to Physical Models – Experimental Observations – Photoelectric Effect – Atomic spectra – Bhr model – Quantum Mechanics – Probability and Uncertainty Principle – Schrodinger Wave Equation – Potential Well Equation – Potential well Problem – Tunneling.

**UNIT II: ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9**

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators – Direct and Indirect Semiconductors – Variation of Energy Bands with Alloy Composition – Charge Carriers in Semiconductors – Electrons and Holes – Electrons and holes in Quantum Wells – Carrier Concentrations – Fermi Level – Electron and Hole Concentrations at Equilibrium – Temperature Dependence of Carrier Concentrations – Compensation and Space Charge Neutrality – Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility – Drift and Resistance – Effects of Temperature and

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

Doping on Mobility – High Field effects – Hall Effect – invariance of Fermi level at equilibrium – Fabrication of p-n junctions, Metal semiconductor junctions.

**UNIT III: METAL OXIDE SEMICONDUCTOR FET 9**

GaAs MESFET – High Electron Mobility Transistor – Short channel Effects – Metal Insulator Semiconductor FET – Basic Operation and Fabrication – Effects of Real Surfaces – Threshold Voltage – MOS capacitance Measurements – Current – Voltage Characteristics of MOS Gate Oxides – MOS Field Effect Transistor – Output Characteristics – Transfer characteristics - Short Channel MOSFET V-I characteristics – Control of Threshold Voltage – Substrate Bias Effects - Sub threshold characteristics – Equivalent Circuit for MOSFET –MOSFET Scaling and Hot Electron Effects – Drain – Induced Barrier Lowering – short channel and Narrow width Effect – Gate Induced Drain Leakage.

**UNIT IV: OPTO ELECTRON DEVICES 9**

Photodiodes – Current and Voltage in illuminated Junction – Solar Cells – Photo detectors – Noise and Bandwidth of Photo detectors – Light Emitting Diodes – Light Emitting Material – Fiber Optic Communication Multilayer Heterojunctions for LEDS – Lasers – Semiconductor lasers – Population Inversion at a Junction Emission Spectra for p-n junction – Basic Semiconductor laser – Materials for Semiconductor laser.

**UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9**

Tunnel Diode, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode – transferred – electron mechanism, formation and drift of space charge domains, p-n-p-n diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

**TOTAL: 45**

**TEXT BOOKS**

1. Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5<sup>th</sup> Edition, PHI, 2003.

**REFERENCES**

1. Donald A. Neaman, Semiconductor Physics and Devices, 3<sup>rd</sup> Edition, TMH, 2002.
2. Yannis Tsvividis, Operation & Mode line of MOS Transistor, 2<sup>nd</sup> Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & aamitava Das Gupta, Semiconductor Devices Modeling Technology, PHI, 2004.
4. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19152E74EP

*ELECTIVE – IV*  
**SEMESTER VII**

**COMPUTER HARDWARE AND INTERFACING 3 0 0 3**

**AIM**

To enable the student to get a detailed knowledge of all the hardware components that make up a computer and to understand the different interfaces required for connecting these hardware devices.

**OBJECTIVES**

- To introduce issues related to CPU and memory.
- To understand the components on the motherboard
- To understand different storage media
- To introduce the features of different I/O peripheral devices and their interfaces.

**UNIT I CPU AND MEMORY 9**

CPU essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel’s CPU – CPU over clocking – over clocking requirements – over clocking the system – over clocking the Intel processors – Essential memory concepts – memory organizations – memory packages – modules –memory.

**UNIT II MOTHERBOARDS 9**

Pentium4 mother board -form factor – upgrading a mother board – chipsets – north bridge – south bridge –motherboard BIOS – POST – BIOS features – BIOS and Boot sequences – BIOS shortcomings and compatibility issues – power supplies and power management – concepts of switching regulation – potential power problems – power management.

**UNIT III STORAGE DEVICES 9**

The floppy drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector layout –CDROM electronics – DVD-ROM – DVD media – DVD drive and decoder.

**UNIT IV I/O PERIPHERALS 9**

Parallel port – signals and timing diagram – IEEE1284 modes – asynchronous communication - serial port signals – video adapters – graphic accelerators – 3D graphics accelerator issues

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT V BUS ARCHITECTURE 9**

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

**TOTAL: 45**

**TEXT BOOK**

1. Stephen J. Bigelow, “Trouble Shooting, maintaining and Repairing PCs”, Tata McGraw-Hill, New Delhi, 2001.

**REFERENCES**

1. Craig Zacker & John Rourke, “The complete reference:PC hardware”, Tata McGraw-Hill, New Delhi, 2001.
2. Mike Meyers, “Introduction to PC Hardware and Trouble shooting”, Tata McGraw-Hill, New Delhi, 2003.
3. B.Govindarajulu, “IBM PC and Clones hardware trouble shooting and maintenance”, Tata McGraw-Hill, New Delhi, 2002.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**





## **DEPARTMENT OF ELECTRONICS AND COMMUNICATION**

# **PROGRAMME HANDBOOK**

**M.TECH. – COMMUNICATION SYSTEMS**

**FULL TIME PROGRAMME  
Regulation 2019**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**M.TECH. COMMUNICATION SYSTEMS - FULL TIME-R-2019**

**SEMESTER I – IV CURRICULUM**

**SEMESTER I**

S.N	SUB CODE	SUBJECT	L	T	P	C
<b>Theory</b>						
1	19248S11B	Applied Mathematics for Electronics Engineering	3	1	0	4
2	19271C12	Statistical Signal Processing	3	1	0	4
3	19271C13	Modern Digital Communication Systems	3	1	0	4
4	19271C14	Communication Protocol Engineering	4	0	0	4
5	19271C15	Advanced Radiation Systems	4	0	0	4
6	19271E16_	Elective-I	3	0	0	3
<b>Practical</b>						
7	19271L17	Communication Systems Lab - I	0	0	3	3
<b>Research Skill Development (RSD) Course</b>						
8	19271CRS	Research Led Seminar	1	0	0	1
<b>Total</b>			21	3	3	27

**SEMESTER II**

S.N	SUB CODE	SUBJECT	L	T	P	C
<b>Theory</b>						
1	19271C21	Mobile Communication Networks	4	0	0	4
2	19271C22	Advanced Microwave Systems	4	0	0	4
3	19271C23	Fiber Optic Networking	4	0	0	4
4	19271E24_	Elective-II	3	0	0	3
5	19271E25_	Elective-III	3	0	0	3
<b>Practical</b>						
6	19271L26	Communication Systems Lab - II	0	0	3	3
7	192TECWR	Technical Writing /Seminars	0	0	3	3
<b>Research Skill Development (RSD) Course</b>						
8	19271CRM	Research Methodology	3	0	0	3
9	19271CBR	Participation in Bounded Research	2	0	0	2
<b>Total</b>			23	0	6	29

**SEMESTER III**

S.N	SUB CODE	SUBJECT	L	T	P	C
<b>Theory</b>						
1	19271C31	Wireless Sensor Networks	4	0	0	4
2	19271E32_	Elective – IV	3	0	0	3
3	19271E33_	Elective – V	3	0	0	3
4	19271E34_	Elective – VI	3	0	0	3

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

S.N	SUB CODE	SUBJECT	L	T	P	C
<b>Project</b>						
5	19271P35	Project Phase – I	0	0	10	10
<b>Research Skill Development (RSD) Course</b>						
6	19271CSR	Design / Socio - Technical Project	0	0	6	6
<b>Total</b>			13	0	16	29

#### SEMESTER IV

S.N	SUB CODE	SUBJECT	L	T	P	C
1	19271P41	Project Phase – II	0	0	15	15
<b>Total</b>			0	0	15	15
<b>TOTAL NO. OF CREDITS</b>						<b>100</b>

#### LIST OF ELECTIVES

##### Elective-I (SEMESTER – I)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E16A	Internetworking and Multimedia	3	0	0	3
2.	19271E16B	Digital Image Processing	3	0	0	3
3.	19271E16C	LASER Communication	3	0	0	3

##### Elective-II (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E24A	High Speed Switching Architecture	3	0	0	3
2.	19271E24B	DSP Processor Architecture and Programming	3	0	0	3
3.	19271E24C	Digital Speech Processing	3	0	0	3

##### Elective-III (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E25A	Digital Communication Receivers	3	0	0	3
2.	19271E25B	Soft Computing	3	0	0	3
3.	19271E25C	Communication Network Security	3	0	0	3

##### Elective-IV (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E32A	Software Defined Radio	3	0	0	3
2.	19271E32B	Satellite Communication	3	0	0	3
3.	19271E32C	CDMA Systems	3	0	0	3

##### Elective-V (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E33A	Wavelets and Multi Resolution Processing	3	0	0	3
2.	19271E33B	High Performance Communication Networks	3	0	0	3

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

S.N	SUB CODE	SUBJECT	L	T	P	C
3.	19271E33C	Advanced Microprocessors and Microcontrollers	3	0	0	3

**Elective-VI (SEMESTER – III)**

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	19271E34A	Simulation of Communication Networks	3	0	0	3
2.	19271E34B	Medical Imaging	3	0	0	3
3.	19271E34C	Mobile ADHOC Networks	3	0	0	3

**M.TECH. COMMUNICATION SYSTEMS - FULL TIME-R-2019**

**Course Structure and 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	01	10	01	06	03	09	-	-	29
IV	-	-	01	15	-	-	-	-	-	-	15
<b>Total Credits</b>											<b>100</b>

\*RSD-Research Skill Development

**HOD**

**DEAN**

**DEAN -  
ACADEMIC AFFAIRS**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**19248S11B APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERING****L T P C  
31 0 4****AIM:**

The primary aim of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable in communication engineering.

**OBJECTIVES:**

The primary objective of this course will help the students to identify, formulate, abstract, and solve problems using mathematical tools from a variety of mathematical areas, including fuzzy logic, matrix linear programming, probability, numerical solution of ordinary differential equations and queuing models.

**UNIT I CALCULUS OF VARIATIONS 9**

Functional – Euler's equation-Variational problems involving one unknown function-several unknown functions-functional dependent on higher order derivatives-several independent variables-isoperimetric problems.

**UNIT II INTEGRAL TRANSFORMS AND WAVE EQUATIONS 9**

Fourier transform pairs, Properties – Fourier Sine and Cosine transforms, Convolution integrals, Evaluation of integrals using Fourier Transform.Discrete Fourier Transform -properties. Application of Fourier transform to wave equation.Z-transform-properties-inverse transform-solution to difference equation.

**UNIT III LINEAR PROGRAMMING 9**

Simplex algorithm-two phase method-duality-transportation and assignment problems-inventory-scheduling.

**UNIT IV RANDOM PROCESS AND QUEUING THEORY 9**

Classification – auto correlation-cross correlation-ergodicity-power spectral density function-Poisson process.Single and multiple server Markovian queuing models- customer impatience-queuing applications.

**UNIT V TESTING OF HYPOTHESIS 9**

Sampling distributions-Testing of hypothesis of normal, t, chi square, F distributions for testing mean and variance- large sample test. Analysis of variance – one way classification.

**Tutorial :15****Total:60****OUTCOMES:**

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

- Concepts on vector spaces, linear transformation, inner product spaces, eigenvalues and generalized eigenvectors.

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

- Apply various methods in linear algebra to solve systems of linear equations.
- Could develop a fundamental understanding of linear programming models, able to develop a linear programming model from problem description, apply the simplex method for solving linear programming problems.
- Numerical solution of differential equations by single and multistep methods.
- Computation of probability, random variables and their associated distributions, correlations and regression.
- Conceptualize the principle of optimality and sub-optimization, formulation and computational procedure of dynamic programming.
- Exposing the basic characteristic features of a queuing system and acquiring skills in analyzing queuing models.
- Using discrete time Markov chains to model computer systems.

### **BOOKS FOR REFERENCES :**

1. Grewal.B.S. “Higher Engineering Mathematics”, Khanna Publications, 2005.
2. Kapoor.J.N. &Saxena.H.C., Mathematical Statistics, S.Chand& Co., New Delhi.
3. Taha.H.A. “Operation Research – An Introduction”, 6<sup>th</sup> Edition, PHI, 1997.
4. M.K. Venkataraman, “Higher Mathematics for Engineering & Science”, National Publishing Company, 2000.
5. Kandasamy, “Engineering Mathematics Volume II, S.Chand& Co.
6. P.K. Guptha, D.S. Hira, Operations Research, S.Chand& Co., 1999
7. T.Veerarajan, Probability, Statistics and Random Processes, TMH, 2002

19271C12

STATISTICAL SIGNAL PROCESSING

L T P C

310 4

**AIM:**

The student comprehends mathematical description and modelling of discrete time random signals.

**OBJECTIVES:**

- The student is conversant with important theorems and algorithms.
- The student learns relevant figures of merit such as power, energy, bias and consistency.
- The student is familiar with estimation, prediction and filtering concepts and techniques.

**UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9**

Discrete Random Processes-, Autocorrelation and Autocovariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram -, Parameter estimation, Bias and consistency.

**UNIT II SPECTRUM ESTIMATION 9**

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method, Parametric Methods - AR, MA, and ARMA model based spectral estimation.

**UNIT III SIGNAL MODELING AND OPTIMUM FILTERS 9**

Introduction- Least square method – Pade approximation – Prony's method – Levinson Recursion – Lattice filter - FIR Wiener filter – Filtering – Linear Prediction – Non Causal and Causal IIR Wiener Filter – Mean square error – Discrete Kalman filter

**UNIT IV ADAPTIVE FILTERS 9**

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

**UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9**

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation for sampling rate conversion- Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

**Total:45 Periods****OUTCOMES:**

- Formulate time domain and frequency domain description of Wide Sense Stationary process in terms of matrix algebra and relate to linear algebra concepts.
- State Parseval's theorem, W-K theorem, principle of orthogonality, spectral factorization theorem, Widrow-Hoff LMS algorithm and Shannon's sampling theorem, and define linear prediction, linear

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

estimation, sample auto-correlation, periodogram, bias and consistency.

- Explain various noise types, Yule-Walker algorithm, parametric and non-parametric methods, Wiener and Kalman filtering, LMS and RMS algorithms, Levinson Durbin algorithm, adaptive noise cancellation and adaptive echo cancellation, speed versus convergence issues, channel equalization, sampling rate change, subband coding and wavelet transform.
- Calculate mean, variance, auto-correlation and PSD for WSS stochastic processes, and derive prediction error criterion, Wiener-Hoff equations, Parseval's theorem, W-K theorem and normal equations.
- Design AR, MA, ARMA models, Wiener filter, anti aliasing and anti imaging filters, and develop FIR adaptive filter and polyphase filter structures.
- Simulate spectral estimation algorithms and basic models on computing platforms.

#### **BOOKS FOR REFERENCES :**

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et al., 'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G. Manolakis et al., 'Statistical and adaptive signal Processing', McGraw Hill, New York, 2000.



19271C13

## MODERN DIGITAL COMMUNICATION SYSTEMS

L T P C  
31 0 4**AIM:**

To understand the basics of signal-space analysis and digital transmission.

**OBJECTIVES:**

- To understand the coherent and noncoherent receivers and its impact on different channel characteristics.
- To understand the different Equalizers
- To understand the different block coded and convolutional coded digital communication systems.
- To understand the basics of Multicarrier and Multiuser Communications.

**UNIT I COHERENT AND NON-COHERENT COMMUNICATION: 9**

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Non coherent receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK; M-PSK; M-DPSK, -BER Performance Analysis.

**UNIT II BANDLIMITED CHANNELS AND DIGITAL MODULATIONS: 9**

Eye pattern; demodulation in the presence of ISI and AWGN; Equalization techniques – IQ modulations; QPSK; QAM; QBOM; -BER Performance Analysis. – Continuous phase modulation; CPM; CPFSK; MSK, OFDM. OFDM signal processing; Peak Power Problem: PAP reduction schemes-Clipping, Filtering, Coding and Scrambling.

**UNIT III BLOCK CODED DIGITAL COMMUNICATION: 9**

Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes; Hamming; Golay; Cyclic; BCH ; Reed – Solomon codes.

**UNIT IV CONVOLUTIONAL CODED DIGITAL COMMUNICATION: 9**

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding. Model of spread Spectrum Digital Communication System-Direct Sequence Spread Spectrum Signals, Error rate performance of the coder, Generation of PN Sequences- Frequency-Hopped Spread Spectrum Signals, Performance of FH Spread Spectrum Signals in an AWGN Channel- Synchronization of Spread Spectrum Systems.

**UNIT V MULTICARRIER AND MULTIUSER COMMUNICATIONS 9**

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, sub optimum detectors, successive interference cancellation.

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

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Develop the ability to understand the concepts of signal space analysis for coherent and non- coherent receivers.
- Conceptually appreciate different Equalization techniques
- Possess knowledge on different block codes and convolutional codes.
- Comprehend the generation of OFDM signals and the techniques of multiuser detection.

**BOOKS FOR REFERENCES :**

1. M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signalling and detection, Prentice HallIndia, New Delhi. 1995.
2. Simon Haykin, Digital communications, John Wiley and sons, 1998
3. Wayne Tomasi, Advanced electronic communication systems, 4th Edition Pearson Education Asia, 1998
4. B.P.Lathi Modern digital and analog communication systems, 3rd Edition, Oxford University press 1998.
5. John G. Proakis, Digital Communications, 4th Edition, McGraw-Hill, New york , 2001

**AIM:**

To expose the students to the layered architecture for communication networks and the specific functionality of the network layer.

**OBJECTIVES:**

- To enable the student to understand the basic principles of routing and the manner this is implemented in conventional networks and the evolving routing algorithms based on Internetworking requirements, optical backbone and the wireless access part of the network.
- To enable the student to understand the different routing algorithms existing and their performance characteristics.

**UNIT I NETWORK INTRODUCTION****9**

Introduction: Communication model, Communication Software, Communication Subsystems, Communication Protocol Definition/Representation Formal and Informal Protocol Development Methods, Protocol Engineering Phases Error Control, Flow Control Type of Transmission Errors, Linear Block Code, Cyclic Redundancy Checks, Introduction to Flow Control, Window Protocols

**UNIT II NETWORK REFERENCE MODEL****9**

Sequence Numbers, Negative Acknowledgments, Congestion Avoidance Network Reference Model: Layered Architecture, Network Services and Interfaces, Protocol Functions Encapsulation, Segmentation, Reassembly, Multiplexing, Addressing, OSI Model Layer Functions, TCP/IP Protocol Suite, Application Protocols

**UNIT III PROTOCOL SPECIFICATIONS****9**

Components of protocol, Specifications of Communication service, Protocol entity, Interface, Interactions, Multimedia protocol, Internet protocol, SDL, SDL based protocol- other protocol specification languages

**UNIT IV PROTOCOL CONFORMANCE/PERFORMANCE TESTING****9**

Conformance testing methodology and framework, Conformance test architectures, Test sequence generation methods, Distributed architecture by local methods, Conformance testing with TTCN, systems with semi controllable interfaces - RIP, SDL based tools for conformance testing, SDL based conformance testing of MPLS Performance testing, SDL based performance testing of TCP and OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using Bridge, Scalability testing

**UNIT V PROTOCOL SYNTHESIS AND IMPLEMENTATION****9**

Protocol synthesis, Interactive synthesis algorithm, Automatic synthesis algorithm, Automatic synthesis of SDL from MSC, Protocol Re-synthesis; Requirements of protocol implementation, Object based approach to protocol implementation, Protocol compilers, Tool for protocol engineering

**COURSE OUTCOMES:**

- Given the network and user requirements and the type of channel over which the network has to operate, the student would be in a position to apply his knowledge for identifying a suitable routing algorithm, implementing it and analyzing its performance.
- The student would also be able to design a new algorithm or modify an existing algorithm to satisfy the evolving demands in the network and by the user applications.

**BOOKS FOR REFERENCES :**

1. PallapaVenkataram and SunilkumarS.Manvi, “Communication protocol Engineering”, EasternEconomy edition, 2004
2. Richard Lai and Jirachiefpattana, “Communication Protocol Specification and Verification”, KluwerPublishers, Boston, 1998.
3. Tarnay, K., “Protocol Specification and Testing”, Plenum, New York, 1991.
4. Mohamed G. Gouda, “Elements of Network Protocol Design”, John Wiley & Sons, Inc. New York,USA, 1998
5. V.Ahuja, “Design and Analysis of Computer Communication networks”, McGraw-Hill, London,1982.
6. G.J.Holtzmann, “Design and validation of Computer protocols”, Prentice Hall, New York, 1991.



- Knowledge of modern antenna design

#### **BOOKS FOR REFERENCES :**

1. Balanis, C.A., "Antenna Theory" Wiley,2003
2. Warren L. Stutzman and Gary A. Thiele," Antenna theory and design"John Wiley and sons 1998
3. Jordan, E.C., " Electromagnetic waves and Radiating systems". PHI 2003
4. Krauss, J.D., "Radio Astronomy" McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D.,Fleisch,D.A., "Electromagnetics" McGraw-Hill,1999

**OBJECTIVES:**

- To acquire knowledge on Transmission line and S- parameter estimation of microwave devices.
- To introduce the basics of Microstrip Patch Antenna and its analysis.
- To study & measure the performance of digital communication systems.
- To provide a comprehensive knowledge of Wireless Communication.
- To learn about the design of digital filters and its adaptive filtering algorithms.

**LIST OF EXPERIMENTS:**

1. Antenna Radiation Pattern measurement.
2. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
3. Implementation of Adaptive Filters, period gram and multistage multirate system in DSP Processor
4. Performance evaluation of Digital Data Transmission through Fiber Optic Link.
5. Study of Spread Spectrum Techniques.
6. Simulation of QMF using Simulation Packages.
7. Implementation of Video Link using Optical Fiber.
8. Implementation of Linear and Cyclic Codes.

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

- Measure and analyze various transmission line parameters.
- Design Microstrip patch antennas.
- Implement the adaptive filtering algorithms
- To generate and detect digital communication signals of various modulation techniques using MATLAB.





video across Internet, Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

**Total:45 Periods**

## **Outcomes**

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

- Understand the state-of-art developments in Internet technologies and applications
- Understand the development of next generation Internet
- Appreciate the principles used in designing Internet protocols for multimedia applications, and so understand why standard protocols are designed the way that they are
- Be able to solve problems for the design of multimedia applications on Internet.

## **BOOKS FOR REFERENCES :**

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd.Singapore, 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 1995.
3. Tay Vaughan, Multimedia - Making it to work, 4ed, Tata McGraw Hill ,NewDelhi, 2000.
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, PHI ,

**19271E16B**

**DIGITAL IMAGE PROCESSING**

**L T P C**  
**3 0 0 3**

**AIM:**

The aim of this course is to explain the fundamentals of digital image processing.

**OBJECTIVES:**

- To understand the image fundamentals.
- To understand the various image segmentation techniques.
- To extract features for image analysis.
- To introduce the concepts of image registration and image fusion.

**UNIT I DIGITAL IMAGE FUNDAMENTALS 9**

Elements of digital image processing systems - Elements of visual perception - Psycho visual model- Brightness - Contrast - Hue - Saturation - Mach band effect - Color image fundamentals – RGBHSI models - Image sampling - Quantization - Dither - Two-dimensional mathematical preliminaries.

**UNIT II IMAGE TRANSFORMS 9**

1D DFT - 2D transforms - DFT - DCT - Discrete Sine - Walsh - Hadamard - Slant - Haar - KLT SVD - Wavelet Transform.

**UNIT III ENHANCEMENT AND RESTORATION 9**

Histogram modification and specification techniques - Noise distributions - Spatial averaging - Directional Smoothing – Median - Geometric mean - Harmonic mean – Contra harmonic and Yp mean filters - Homomorphic filtering - Color image enhancement - Image Restoration – Degradation model - Unconstrained and Constrained restoration - Inverse filtering - Removal of blur caused by uniform linear motion - Wiener filtering - Geometric transformations - Spatial transformations -Gray Level interpolation.

**UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9**

Edge detection - Image segmentation by region growing - Region splitting and merging – Edge linking - Image Recognition - Patterns and pattern classes - Matching by minimum distance classifier - Matching by correlation - Back Propagation Neural Network - Neural Network applications in Image Processing.

**UNIT V IMAGE COMPRESSION 9**

Need for data compression - Huffman - Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Block Truncation Coding - Transform Coding - DCT and Wavelet - JPEG -MPEG – Standards - Concepts of Context based Compression.

**Total:45 Periods**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to**

- Explain the fundamentals of digital image processing.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- Describe image various segmentation and feature extraction techniques for image analysis.
- Discuss the concepts of image registration and fusion.

### **BOOKS FOR REFERENCES :**

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Second Edition, Pearson Education Inc., 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.
3. David Salomon , "Data Compression The Complete Reference", 2nd Edition, SpringerVerlag , New York Inc., 2001.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", Pearson Education, Inc., 2004.
5. William K. Pratt, "Digital Image Processing", John Wiley, New York, 2002.
6. MilmanSonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", 2nd edition, Brooks/Cole, Vikas Publishing House, 1999.

**19271E16C**

**LASER COMMUNICATION  
3 0 0 3**

**L T P C**

**AIM:**

The aim of this course is to gain knowledge about light and its propagation

**OBJECTIVES:**

- To study the nonlinear optic devices.
- To learn about holography.
- To study the different types of laser and its effects.

**UNIT I LASER COMMUNICATIONS 9**

Atmospheric low loss windows, optical sources and detectors for these windows, Characteristics of source and detectors. Optical transmitting and receiving antennas.

**UNIT II SYSTEM DESIGN 9**

Link equation, Transmitter terminal, Antenna design, Antenna gain, Beam width, C/N, Optical detectors, Optical modulation formats, Deriving error statistics, Signal requirements for acquisition and tracking, Fundamentals of system design.

**UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9**

Performance and Geometries, output wavelength control, Semiconductor laser lifetime, Direct and indirect modulation techniques and radiation effects.

**UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9**

Direct detection, coherent detection and demodulation. Gimbals in transceiver design, Receiver options and optics; Lasers; antennas / Telescope, Internal optical systems, Transmitter analysis.

**UNIT V LASER BEAM POINTING CONTROL 9**

Acquisition and Tracking systems, System description, Acquisition methodology, racking and pointing control system, RF cross link system design, link equation.

**Total:45 Periods**

**Outcomes:**

Students are able to

- Recognize and classify the structures of Optical fiber and types.
- Discuss the channel impairments like losses and dispersion.
- Analyze various coupling losses.
- Classify the Optical sources and detectors and to discuss their principle.
- Familiar with Design considerations of fiber optic systems.
- To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.

**BOOKS FOR REFERENCES :**

1. Morris Katzman, "Laser Satellite Communications", Prentice Hall Inc, New York, 1991.
2. J. Franz and V.K.Jain, "Optical Communication Systems", Narosa Publication, New Delhi, 1994.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19271C21

**MOBILE COMMUNICATION NETWORKS**  
**4 0 0 4**

L T P C

**AIM:**

The aim of this course is to provide the basic cellular system concepts.

**OBJECTIVES:**

- To understand the basic cellular system concepts.
- To have an insight into the various propagation models and the speech coders used in mobile communication.
- To understand the multiple access techniques and interference reduction techniques in mobile communication

**UNIT I WIRELESS CHANNEL PROPAGATION AND MODEL 9**

Propagation of EM signals in wireless channel–Reflection, diffraction and Scattering–Small scale fading-channel classification-channel models–COST-231 Hata model, Longley-Rice Model,NLOS Multipath Fading Models: Rayleigh, Rician, Nakagami, Composite Fading–shadowingDistributions, Link power budget Analysis

**UNIT II OPERATION AND PROPAGATION MODELS AND AIR PROTOCOLS 9**

Operation of first, second, and third generation wireless networks: cellular systems, medium access techniques, Mobile networks Elementary Principles of cellular Telephony Channel Division Techniques(TDMA, FDMA, CDMA) Cellular Coverage Methods Network Planning and Resource Allocation,Network Dimensioning ,Mobility Management Procedures

**UNIT III MOBILE NETWORK ARCHITECTURE 9**

General Architecture definition, Mobile Terminals (MT, SIM) Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC) User and Control Plane Protocol Stack, MAP & SS#7, The Key Role of Signaling Interfaces and NetworkEntities Relation The Physical Channel, The Logical Channels Terminal, Call and Network ManagementProcedures, Network Planning.

**UNIT IV WIRELESS LOCAL AREA NETWORKS 9**

Wireless Local Area Networks , General Characteristics of the Hiperlan System, 802.11 Standard, BasicDCF access schemeDCF Access Scheme with Handshaking, PCF Access Scheme, The 802.11a Standard, Mobile Ad HocNetworks, Wireless Sensor Networks, Routing Energy Efficiency, Localization, Clustering.

**UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 9**

Security in Wireless Networks, Secure routing, Key Pre-distribution and Management, Encryption andAuthentication, Security in Group Communication, Trust Establishment and Management, Denial ofService Attacks, Energy-aware security mechanisms, Location verification, Security on Data fusion.

**Total:45 Periods****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

**Outcomes :**

- Discuss cellular radio concepts.
- Identify various propagation effects.
- To have knowledge of the mobile system specifications.
- Classify multiple access techniques in mobile communication.
- Outline cellular mobile communication standards.
- Analyze various methodologies to improve the cellular capacity

**BOOKS FOR REFERENCES :**

1. W. Stallings, "Wireless Communications and Networks", Second Edition Prentice Hall, 2007.
2. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
3. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall, 2002.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", McGraw-Hill, 2000.
5. J. Schiller, "Mobile Communications", Addison Wesley, 2000.
6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards", Addison Wesley, 2001.
7. Uyles Black, "Mobile and Wireless Networks", Prentice Hall PTR, 1996.

19271C22

ADVANCED MICROWAVE SYSTEMS

L T PC  
4 00 4**AIM:**

The aim of this course is to explain fundamentals of microwave integrated circuits.

**OBJECTIVES:**

- To understand the fundamentals of Microwave integrated circuits.
- To understand the various components for Wireless Communications.
- To know the basic techniques needed for analysis of Microwave systems.

**UNIT I INTRODUCTION TO MONOLITHIC MICROWAVE INTEGRATED CIRCUITS 9**

Introduction to Monolithic Microwave Integrated Circuits (MMICs), their advantages over discrete circuits, materials, MMIC fabrication techniques, MOSFET fabrication. Thin film formation.

**UNIT II MICROSTRIP ANALYSIS 9**

Planar transmission lines for MICs. Method of conformal transformation for microstrip analysis, concept of effective dielectric constant, Effective dielectric constant for microstrip, Losses in Microstrip

**UNIT III SLOT LINE ANALYSIS 9**

Slot Line Approximate analysis and field distribution, Transverse resonance method and evaluation of slot line impedance, comparison with micro strip line.

**UNIT IV LUMPED ELEMENTS FOR MICS 9**

Lumped Elements for MICS: Use of Lumped Elements, Capacitive elements, Inductive elements and Resistive elements.

**UNIT V MICROWAVE SEMICONDUCTOR DEVICES & MICROWAVE PASSIVE COMPONENTS 9**

Microwave semiconductor Devices & Microwave passive components Parametric amplifiers, tunnel diode, varactor diode, PIN diode, Gunn diode, their principle of operation, performance characteristics & applications, scattering parameter calculations of E plane-Tee, Magic Tee, Directional Coupler.

**Total:45 Periods****OUTCOMES:**

- Capability to design Microwave circuits.
- To be able to analyze microwave integrated circuits.

**REFERENCES:**

1. Gupta,K.C, and Amarjitsingh “Microwave Integrated Circuits” John Wiley and sons – Wiley EasternReprint, 1978.
2. Hoffmann, R.K “Handbook of Microwave Integrated Circuits” Artech House, 1987.

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

**AIM:**

The aim of the course is to design and analyze network components.

**OBJECTIVES:****The students should be made to understand:**

- Optical system components like optical amplifiers, wavelength converters.
- Up-to-date survey of development in Optical Network Architectures.
- Packet switching.
- Network design perspectives.
- Different Optical Network management techniques and functions.

**UNIT I OPTICAL FIBER COMMUNICATION AND TRANSMISSION CHARACTERISTICS 9**

Introduction, Historical development, general system, advantages, disadvantages, and applications of optical fiber communication, optical fiber waveguides, Ray theory, cylindrical fiber single mode fiber, cutoff wavelength, mode field diameter. Optical Fibers: fiber materials, photonic crystal, fiber optic cables specialty fibers.

Attenuation, absorption, scattering losses, bending loss, dispersion, Intra modal dispersion, Inter modal dispersion.

**UNIT II OPTICAL SOURCES AND DETECTORS, OPTICAL AMPLIFIERS AND NETWORKS 9**

Introduction, LED's, LASER diodes, Photo detectors, Photo detector noise, Response time, double hetero junction structure, Photo diodes, comparison of photo detectors.

Optical amplifiers, basic applications and types, semiconductor optical amplifiers, EDFA. Optical Networks: Introduction, SONET / SDH, Optical Interfaces, SONET/SDH rings, High – speed light – waveguides.

**UNIT III FIBER COUPLERS AND CONNECTORS AND ANALOG AND DIGITAL LINKS 9**

Introduction, fiber alignment and joint loss, single mode fiber joints, fiber splices, fiber connectors and fiber couplers.

Analog links – Introduction, overview of analog links, CNR, multichannel transmission techniques, RF over fiber, key link parameters, Radio over fiber links, microwave photonics. Digital links – Introduction, point-to-point links, System considerations, link power budget, resistive budget, short wavelength band, transmission distance for single mode fibers, Power penalties, nodal noise and chirping.

**UNIT IV OPTICAL RECEIVER 9**

Introduction, Optical Receiver Operation, receiver sensitivity, quantum limit, eye diagrams, coherent detection, burst mode receiver operation, Analog receivers.



## **UNIT V WDM CONCEPTS AND COMPONENTS 9**

WDM concepts, overview of WDM operation principles, WDM standards, Mach-Zehender interferometer, multiplexer, Isolators and circulators, direct thin film filters, active optical components, MEMS technology, variable optical attenuators, tunable optical fibers, dynamic gain equalizers, optical drop multiplexers, polarization controllers, chromatic dispersion compensators, tunable light sources.

**Total:45 Periods**

### **OUTCOMES:**

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

- Design and Analyze Network Components
- Assess and Evaluate optical networks

### **BOOKS FOR REFERENCES :**

1. Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective, MorganKaufmann, 2nd edition, 2001.
2. VivekAlwayn, Optical Network Design and Implementation, Pearson Education, 2004.
3. Hussein T.Mouftab and Pin-Han Ho, Optical Networks: Architecture and Survivability, Kluwer Academic Publishers, 2002.
4. Biswanath Mukherjee, Optical Communication Networks, McGraw Hill, 1997

# LIST OF ELECTIVES

## ELECTIVE – II (SEMESTER II)

*ELECTIVE -II*  
**SEMESTER II**

**19271E24A HIGH SPEED SWITCHING ARCHITECTURE**  
**300 3**

**L T P C**

### AIM:

To expose the student to the advances in packet switching architectures and IP addressing and switching solutions and approaches to exploit and integrate the best features of different architectures for high speed switching.

### OBJECTIVES:

- To enable the student to understand the basics of switching technologies and their implementation LANs, ATM networks and IP networks.
- To enable the student to understand the different switching architectures and queuing strategies and their impact on the blocking performances.

### UNIT I HIGH SPEED NETWORK 9

LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN -SDH multiplexing structure - ATM standard; ATM adaptation layers.

### UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

### UNIT III ATM SWITCHING ARCHITECTURE 9

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting – rearrangeable networks - full and partial connection networks – non-blocking networks –recursive network – construction and comparison of non-blocking network - switches with deflection routing – shuffle switch - tandem banyan.

### UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture, - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG\_4 video Transport across internet.

### UNIT V IP SWITCHING 9

Addressing mode - IP switching types-flow driven and topology driven solutions - IP Over ATM address and next hop resolution – multicasting - IPv6 over ATM.

**Total:45 Periods**

### OUTCOMES:

- The student would be able to identify suitable switch architectures for a specified networking scenario and demonstrate its blocking performance.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- The student would be in a position to apply his knowledge of switching technologies, architectures and buffering strategies for designing high speed communication networks and analyse their performance

### **BOOKS FOR REFERENCES :**

1. Achille Patavina, Switching Theory: Architectures and performance in Broadband ATM Networks. John Wiley & Sons Ltd., New York. 1998.
2. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York. 1998.
3. Ranier Handel, Manfred N Huber, Stefan Schroder. ATM Networks-concepts, protocols, applications, 3rd Edition, Addison Wesley, New York, 1999.
4. John A. Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, New York, 1998.

**19271E24B**

**DSP PROCESSOR ARCHITECTURE AND PROGRAMMING**

**L T P C**  
**3 0 0 3**

**AIM:**

The aim of this course is to provide in-depth knowledge on digital signal processor basics.

**OBJECTIVES:**

The objective of this course is to provide in-depth knowledge on

- Digital Signal Processor basics
- Third generation DSP Architecture and programming skills
- Advanced DSP architectures and some applications.

**UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9**

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining –Special Addressing modes in P-DSPs – On chip Peripherals.

**UNIT II TMS320C3X PROCESSOR 9**

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets -Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals –Generating and finding the sum of series, Convolution of two sequences, Filter design

**UNIT III ADSP PROCESSORS I 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 IV ADVANCED PROCESSORS 9**

Architecture of TMS320C54X: Pipeline operation, Addressing modes and assembly language instructions Introduction to Code Composer studio

**UNIT V ADVANCED PROCESSORS II 9**

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

**Total:45Periods**

**OUTCOMES:**

**Students should be able to:**

- Become Digital Signal Processor specialized engineer
- DSP based System Developer

**BOOKS FOR REFERENCES :**

1. B.Venkataramani and M.Bhaskar, “Digital Signal Processors – Architecture, Programming and Applications” – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

2. User guides Texas Instrumentation, Analog Devices, Motorola.

**19271E24C**

**DIGITAL SPEECH PROCESSING**

**L T P C**  
**3 0 0 3**

**AIM:**

To illustrate the concepts of speech signal representations and coding.

**OBJECTIVES:**

- To introduce speech production and related parameters of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.
- To gain knowledge about text analysis and speech synthesis.

**UNIT I MECHANICS OF SPEECH**

**9**

Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features.

Music production – Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system – Psycho acoustics

**UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING**

**9**

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

**UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING**

**9**

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder. Homomorphic speech analysis: Cepstral analysis of Speech – Formant and Pitch Estimation –

**UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH**

**9**

Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method– Solution of LPC equations — Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods — Formant analysis – VELP – CELP.

**UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING**

**9**

Algorithms: Spectral Estimation, dynamic time warping, hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR — ASR systems– Voice response system – Speech Synthesis: Text to speech, voice over IP.

**Total:45 Periods**

**OUTCOMES:**

**Students will be able to:**

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- Choose an appropriate statistical speech model for a given application.
- Design a speech recognition system.
- Use different text analysis and speech synthesis techniques.

**BOOKS FOR REFERENCES :**

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall - 1978
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2<sup>nd</sup> edition – Berlin – 1972
5. I.H.Witten – Principles of Computer Speech – Academic Press – 1982

# LIST OF ELECTIVES

## ELECTIVE – III (SEMESTER II)

*ELECTIVE -III*  
**SEMESTER II**

**19271E25A**

**DIGITAL COMMUNICATION RECEIVERS**

**L T P C**  
**3 0 0 3**

### AIM:

The aim of this course is to understand the basic principles of digital communication techniques.

### OBJECTIVES:

- To understand the basic principles of digital communication techniques.
- To gain knowledge about receivers for AWGN channel and Fading channels.
- To understand the concepts of synchronization and adaptive equalization techniques.

### UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Baseband and bandpass communication, signal space representation, linear and non-linear modulation techniques, and spectral characteristics of digital modulation.

### UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

### UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel

### UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

### UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

**Total:45 Periods**

### OUTCOMES:

Upon Completion of the course, the students will be able to

- Apply basic principles of digital communication techniques.
- Discuss on receivers for AWGN & Fading channel
- Describe various synchronization techniques.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



- Design adaptive equalization algorithms to satisfy the evolving demands in digital communication.

### **BOOKS FOR REFERENCES :**

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, “Digital Communication Receivers”, VolI&II, John Wiley, New York, 1997
2. John. G. Proakis, “Digital Communication”, 4th ed., McGraw Hill, New York, 2001
3. E.A. Lee and D.G. Messerschmitt, “Digital Communication”, 2nd edition, Allied Publishers, NewDelhi, 1994
4. Simon Marvin, “Digital Communication Over Fading channel; An unified approach to performanceAnalysis”, John Wiley, New York, 2000
5. Bernard Sklar, “Digital Communication Fundamentals and Applications, Prentice Hall, 1998

**19271E25B**

**SOFT COMPUTING**

**L T P C  
3 0 0 3**

**AIM:**

The aim of this course is to know the basics of artificial neural networks.

**OBJECTIVES:**

- To provide adequate knowledge about feed forward /feedback neural networks
- To apply the concept of fuzzy logic in various systems.
- To have the idea about genetic algorithms.
- To provide adequate knowledge about the applications of Soft Computing.

**UNIT I ARTIFICIAL NEURAL NETWORKS 9**

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rules-Supervised learning-Back propagation networks-Training algorithm, Practical difficulties, Advanced Algorithms-Adaptive network- Radial basis network-modular network-Applications

**UNIT II UNSUPERVISED NETWORKS 9**

Introduction- unsupervised learning -Competitive learning networks-Kohonen self organising networks-Learning vector quantisation - Hebbian learning - Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Traveling Salesperson problem - Adaptive resonance theory –Bidirectional Associative Memory-Principle component Analysis

**UNIT III FUZZY SYSTEMS 9**

Fuzzy sets-Fuzzy rules: Extension principle, Fuzzy relation- fuzzy reasoning – fuzzy inference systems:Mamdani model, Sugeno model. Tsukamoto model -Fuzzy decision making- Multi objective Decision Making,-Fuzzy classification-Fuzzy control methods -Application

**UNIT IV NEURO-FUZZY MODELLING 9**

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision trees, Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real–Time Recurrent Learning.

**UNIT V GENETIC ALGORITHM 9**

Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittest crossover-Inversion and Deletion-mutation-reproduction-Generational cycle-rank method-rank space method- Other derivative free optimization-simulated annealing, Random search, Downhill simplex search-Application

**Total:45 Periods**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **OUTCOMES:**

- Knowledge on concepts of soft computational techniques.
- Able to apply soft computational techniques to solve various problems.
- Motivate to solve research oriented problems.

## **BOOKS FOR REFERENCES :**

1. Jang J.S.R.,Sun C.T and Mizutani E – “Neuro Fuzzy and Soft computing”, Pearson education(Singapore) 2004
2. David E.Goldberg : “Genetic Algorithms in Search, Optimization, and Machine Learning”, PearsonEducation, Asia,1996
3. LaureneFauseett:”Fundamentals of Neural Networks”, Prentice Hall India, New Delhi,1994.
4. Timothy J.Ross:”Fuzzy Logic Engineering Applications”, McGrawHill, ewYork,1997.
5. S.Rajasekaran and G.A.VijayalakshmiPai “Neural networks,Fuzzylogics,and Genetic algorithms”,Prentice Hall of India,2003
6. George J.Klir and Bo Yuan,”Fuzzy Sets and Fuzzy Logic”,Prentice Hall Inc., New Jersey,1995.

**19271E25C**

**COMMUNICATION NETWORK SECURITY  
300 3**

**L T P C**

**AIM:**

The aim of this course is to understand the need and concept of security.

**OBJECTIVES :**

**The students should be made to:**

- Understand the need and concept of security
- Learn cryptosystems

**UNIT I SYMMETRIC CIPHERS**

**9**

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security; Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES, Differential and Linear CryptAnalysis, Block Cipher Design Principles, Block Cipher Modes of operation, Steganography.

**UNIT II ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS**

**9**

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5-Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs, RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution.

**UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS**

**9**

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-, Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm; Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

**UNIT IV NETWORK SECURITY PRACTICE**

**9**

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

**UNIT V SYSTEM SECURITY**

**9**

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats, Virus Countermeasures; Firewalls- Firewall Design Principles, Trusted Systems.

**Total:45 Periods**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OUTCOMES:**

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

- Explain digital signature standards
- Discuss authentication
- Explain security at different layers

**BOOKS FOR REFERENCES:**

1. William Stallings, “Cryptography and Network Security”, 3rd Edition. Prentice Hall of India, New Delhi,2004
2. William Stallings, “Network Security Essentials”, 2nd Edition. Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman , “Network Security: Private Communication in Public World”, 2nd Edition. PrenticeHall of India, New Delhi ,2004

**OBJECTIVES:**

- To enable the students to verify the basic principles and design aspects involved in high frequency communication systems components
- To expose the student to different high frequency components and conduct the experiments to analyze and interpret data to produce meaningful conclusions and match with theoretical concepts.
- To design and develop RF components using microstrip technology

**LIST OF EXPERIMENTS:**

1. Simulation of Audio and speech compression algorithms
2. Simulation of EZW / SPIHT Image coding algorithm.
3. Simulation of Microstrip Antennas
4. S-parameter estimation of Microwave devices.
5. Study of Global Positioning System.
6. Performance evaluation of simulated CDMA System.
7. Design and testing of a Microstrip coupler.
8. Characteristics of  $\lambda/4$  and  $\lambda/2$  transmission lines.

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

- Apply knowledge to identify a suitable architecture and systematically design an RF system.
- Comprehensively record and report the measured data, and would be capable of analyzing, interpreting the experimentally measured data and producing meaningful conclusions.
- Design and develop microstrip filters.

**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, ScienceDirect 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

### **OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Understand the approaches towards and constraints in good research.
- Identify various statistical tools used in research methodology
- Train in basic computational and excel- skills for research in engineering.

### **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.

**AIM:**

The aim of this course is to study about wireless IP architecture, Packet Data Protocol and LTE network architecture.

**OBJECTIVES:**

- To study about advanced wireless networks, LTE, 4G and Evolutions from LTE to LTE.
- To study about adaptive link layer, hybrid ARQ and graph routing protocol.
- To study about mobility management, cellular network, and micro cellular networks

**UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 8**

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

**UNIT II ARCHITECTURES 9**

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

**UNIT III NETWORKING SENSORS 10**

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols and Wake Up Concepts - S-MAC, The Mediation Device Protocol, Wake Up Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

**UNIT IV INFRASTRUCTURE ESTABLISHMENT 9**

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

**UNIT V SENSOR NETWORK ARCHITECTURE AND MAC PROTOCOLS 9**

Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks. , physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management - MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error control, framing, link management.

**TOTAL- 45 PERIODS**

## **OUTCOMES:**

- Familiar with the latest 4G networks and LTE
- Understand about the wireless IP architecture and LTE network architecture.
- Familiar with the adaptive link layer and network layer graphs and protocol.
- Understand about the mobility management and cellular network.
- Understand about the wireless sensor network architecture and its concept.

## **BOOKS FOR REFERENCES:**

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, "Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. KazemSohraby, Daniel Minoli, &TaiebZnati, "Wireless Sensor Networks- Technology, Protocols, And Applications", John Wiley, 2007.
4. Anna Hac, "Wireless Sensor Network Designs", John Wiley, 2003.

# LIST OF ELECTIVES

## ELECTIVE – IV (SEMESTER III)

*ELECTIVE -IV*  
**SEMESTER III**

**19271E32A SOFTWARE DEFINED RADIO**

**L T P C**  
**3 0 0 3**

### AIM:

The aim of this course is to understand the concepts of software defined radio.

### OBJECTIVES:

**The students should be made to be**

- Understand the concepts of software defined radio
- Learn spectrum sensing and dynamic spectrum access

### **UNIT I: Introduction to SDR 9**

The Need for Software Radios-Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio.Radio frequency implementation issues-The Purpose of the RF Front-End. Dynamic Range: The Principal Challenge of Receiver Design. RF Receiver Front-End Topologies. Enhanced Flexibility of the RF Chain with Software Radios. Importance of the Components -Transmitter Architectures and their Issues. Noise and Distortion in the RF Chain. ADC and DAC Distortion.

### **UNIT II :Direct Digital Synthesis 9**

Introduction. Comparison of Direct Digital Synthesis with Analog Signal Synthesis. Approaches to Direct Digital Synthesis. Analysis of Spurious Signals. Spurious Components due to Periodic Jitter. Band pass Signal Generation. Performance of Direct Digital Synthesis Systems. Hybrid DDS-PLL Systems. Applications of direct Digital Synthesis. Generation of Random Sequences. ROM Compression Techniques.

### **UNIT III Signal Processor and Multi Rate Processing Techniques 9**

Introduction. Sample Rate Conversion Principles. Polyphase Filters. Digital Filter Banks. Timing Recovery in Digital Receivers Using Multirate Digital Filters. DSP Processors; Field Programmable Gate Arrays; Trade-Offs in Using DSPs, FPGAs, and ASICs; Power Management Issues; Using a Combination of DSPs, FPGAs, and ASICs.

### **UNIT IV: Smart Antennas 9**

Vector channel modeling; Benefits of smart antennas; Structures for Beam forming Systems; Smart Antenna Algorithms.Diversity and Space-Time Adaptive Signal Processing; Algorithms for Transmit STAP; Hardware Implementation of Smart Antennas; Array Calibration.

### **UNIT V: Applications –Wireless Aspects of Tele-Health Care 9**

The application of advanced telecommunication , the special requirements especially related to reliability, privacy and trust, Regulatory and safety aspects of tele-health care, Cognitive radio and flexible spectrum usage for tele-healthcare, Cooperative Communications for Tele-health. Case studies: JTRS radio system ,Software defined base stations.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**TOTAL : 45 PERIODS**

**OUTCOMES:**

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

- Compare MAC and network layer design for software defined radio
- Discuss cognitive radio for Internet of Things and M2M technologies

**BOOKS FOR REFERENCES:**

1. Jeffrey H. Reed -Software Radio: A Modern Approach to Radio Engineering Publisher: Prentice Hall PTR; May 2002 ISBN: 0170811580.
2. Wireless Communications: Principles and Practice, 2nd ed, by Rappaport, Prentice-Hall 2002. ISBN 0-17-042232-0.
3. Wireless Application Development, by Skelton, Thomson, 2003, ISBN 0-619-15931-6

**19271E32B**

**SATELLITE COMMUNICATION**

**L T P C**

**30 0 3**

**AIM:**

To understand the basics of satellite orbits. To understand the satellite segment and earth segment.

**OBJECTIVES:**

**The students should be made to be**

- Learn M2M developments and satellite applications
- Understand Satellite Communication In Ipv6 Environment

**UNIT I ORBITAL MECHANICS**

**9**

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations, Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

**UNIT II SPACECRAFT SUBSYSTEMS AND EARTH STATION**

**9**

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems, Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

**UNIT III SPACE LINKS**

**9**

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

**UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS**

**9**

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS). Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures. Hybrid satellite-terrestrial networks

**UNIT V SERVICES AND APPLICATIONS**

**9**

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS, INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Videoconferencing and Internet connectivity

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OUTCOMES:**

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

- Discuss satellite navigation and global positioning system
- Outline deep space networks and inter planetary missions

**BOOKS FOR REFERENCES:**

1. Dennis Roddy, "Satellite Communications", 3rd Edition, McGraw Hill International Editions, 2001
2. Bruce R.Elbert, "Introduction to Satellite Communication" ,Artech House Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnut, "Satellite Communications", 2nd Edition, Wiley, John& Sons, 2002
4. Wilbur L.Pritchard, HendriG.Snyderhood, Robert A.Nelson, "Satellite Communication SystemsEngineering", 2nd Edition, Prentice Hall, New Jersey, 1993
5. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.1990.

**19271E32C**

**CDMA SYSTEMS**

**L T P C  
3 0 0 3**

**AIM:**

The aim of this course is to define the basics of cellular communications and explain the Architecture OF GSM & its Radio Channels.

**OBJECTIVES:**

**The students should be made to be**

- understand cellular concept, widely popular 2G digital, TDMA based mobile system GSM and modern mobile wireless system CDMA.

**UNIT I BASIC CONCEPTS OF CDMA**

**9**

Spread spectrum communication techniques ( DS-SS, FH-SS ), Synchronization in CDMA system, Detection and False alarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

**UNIT II IS-95 CDMA TECHNIQUES**

**9**

Spreading Codes , Power control, Handover techniques, Physical and logical channels and processing (Forward and reverse links)

**UNIT III WCDMA / CDMA 2000**

**9**

Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation & demodulation process , Handoff and power control in 3G systems.

**UNIT IV MULTICARRIER CDMA SYSTEMS**

**9**

Multicarrier CDMA, System design , Performance parameters – BER lower bound, Multiuser detection, UTRA, FDD and TDD systems.

**UNIT V OPTICAL CDMA**

**9**

Prime Codes and it's properties, Generalized and Extended Prime Codes, Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multi wavelength Optical CDMA networks.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

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

- Analyze MIMO system.
- Discuss millimeter wave communication.
- Demonstrate software defined radio and cognitive radio.

**BOOKS FOR REFERENCES:**

1. John G.Proakis, "Digital Communications", McGraw Hill International Ltd, 4th ed., Singapore, 2000.
2. Andrew J. Viterbi, " CDMA: Principles of Spread Spectrum Communication", Addison-Wesley, 1st ed. , 1995.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



3. KavethPahlavan,. K. PrashanthKrishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, "IS -95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation", Pearson Education , 2st ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, " OFDM for Wireless Multimedia Communication" , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, "Wireless Communication", Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, "GSM CDMA One and 3GSystems", Wiley India, 2004.
8. Guu-Chang Yang, "Prime Codes with Application to Optical and Wireless Networks", Artech House, Inc., 2002.

# LIST OF ELECTIVES

## ELECTIVE – V (SEMESTER III)

*ELECTIVE - V*  
**SEMESTER III**

19271E33A

### WAVELETS AND MULTIREOLUTION PROCESSING

**L T P C**  
**3 0 0 3**

#### AIM:

To introduce the fundamentals concepts of wavelet transforms.

#### OBJECTIVE:

- To study system design using Wavelets
- To learn the different wavelet families & their applications.

#### UNIT I INTRODUCTION 9

Vector Spaces - properties - dot product - basis - dimension, orthogonality and orthonormality - relationship between vectors and signals - Signal spaces - concept of Convergence – Generalised Fourier Expansion.

#### UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA Wavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks

#### UNIT III CONTINUOUS WAVELET TRANSFORM 9

Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet, Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time -scale plane for CWT.

#### UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Bank and sub band coding principles - Wavelet Filters - Inverse DWT computation by Filterbanks -Basic Properties of Filter coefficients - Choice of wavelet function coefficients - Derivations of Daubechies Wavelets - Multi-band Wavelet transforms. Introduction to lifting Scheme

#### UNIT V APPLICATIONS 9

Signal Compression – Image Compression techniques: EZW-SPHIT Coding - Image denoising techniques: Noise estimation - Shrinkage rules -. Shrinkage Functions - Edge detection and object Isolation, Image Fusion, and Object Detection.

**TOTAL : 45 PERIODS**

#### OUTCOME:

- The students will be able to apprehend the detailed knowledge about the Wavelet transform & its applications.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **BOOKS FOR REFERENCES:**

1. Rao .R.M and A.S.Bopardikar, "Wavelet Transforms: Introduction to theory and Applications", Pearson Education Asia Pte. Ltd., 2000.
2. Strang G, Nguyen T, "Wavelets and Filter Banks," Wellesley Cambridge Press, 1996
3. Vetterli M, Kovacevic J., "Wavelets and Sub-band Coding," Prentice Hall, 1995
4. Mallat S., "Wavelet tour of Signal Processing", Academic Press, 1996
5. David C.Lay., "Linear Algebra and its applications" Pearson education, 2007.(Unit I only)

**19271E33B**

**HIGH PERFORMANCE COMMUNICATION NETWORKS**

**L T P C**  
**3 0 0 3**

**AIM:**

To familiarize concepts and terminology associated with ATM, Frame Relay, MPLS, Bluetooth technology.

**OBJECTIVES:**

- To appreciate the need for interoperable network management as a typical distributed application
- To be aware of current trends in network technologies

**UNIT I PACKET SWITCHED NETWORKS 9**

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI, DQDB, SMDS: Internetworking with SMDS

**UNIT II ISDN AND BROADBAND ISDN 9**

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

**UNIT III ATM AND FRAME RELAY 9**

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.

Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

**UNIT IV ADVANCED NETWORK ARCHITECTURE 9**

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

**UNIT V BLUETOOTH TECHNOLOGY 9**

The Bluetooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio, The Link Manager, The Host controller interface; The Bluetooth module-Protocol stack Part I: Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

**After the completion of this course, students will be able to**

- Diagnose problems and make minor repairs to computer networks using appropriate diagnostics software
- Demonstrate how to correctly maintain LAN computer systems
- Maintain the network by performing routine maintenance tasks
- Apply network management tools

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **BOOKS FOR REFERENCES:**

1. William Stallings, "ISDN and Broadband ISDN with Frame Relay and ATM", 4th edition, Pearson education Asia, 2002.
2. Leon Gracia, Widjaja, "Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Jennifer Bray and Charles F. Sturman, "BlueTooth" Pearson education Asia, 2001.
4. Sumit Kaseera, Pankaj Sethi, "ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
5. Rainer Handel, Manfred N. Huber and Stefan Schroder, "ATM Networks", 3rd edition, Pearson education Asia, 2002.
6. Jean Walrand and Pravin Varaiya, "High Performance Communication networks", 2nd edition, Harcourt and Morgan Kauffman, London, 2000.
7. William Stallings, "High-speed Networks and Internets", 2nd edition, Pearson education Asia, 2003.

**19271E33C ADVANCED MICROPROCESSORS AND MICROCONTROLLERS**

**L T P C**  
**3 0 0 3**

**AIM:**

To introduce the advanced features in microprocessors and microcontrollers.

**OBJECTIVES:**

- To enable the students to understand various microcontroller architectures
- To expose the students to the fundamentals of microprocessor architecture.

**UNIT I MICROPROCESSOR ARCHITECTURE 9**

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline – pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation

**UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9**

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipelining – Branch prediction – The instruction and caches – Floating point unit – protected mode operation – Segmentation – paging – Protection – multitasking – Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing – Instruction types – Addressing modes – Processor flags – Instruction set – programming the Pentium processor.

**UNIT III HIGH PERFORMANCE RISC ARCHITECTURE :ARM 9**

The ARM architecture – ARM assembly language program – ARM organization and implementation – The ARM instruction set - The thumb instruction set – ARM CPU cores.

**UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9**

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – Parallel I/O ports – Flags – Real time clock – Programmable timer – pulse accumulator – serial communication interface – A/D converter – hardware expansion – Assembly language Programming

**UNIT V PIC MICROCONTROLLER 9**

CPU architecture – Instruction set - Interrupts – Timers – I/O port expansion – I<sup>2</sup>C bus for peripheral chip access – A/D converter – UART

**TOTAL : 45 PERIODS**

**OUTCOMES:**

- The student will be able to work with a suitable microprocessor / microcontroller for a specific real world application.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## **BOOKS FOR REFERENCES:**

1. Daniel Tabak , ‘ ‘ Advanced Microprocessors” McGraw Hill.Inc., 1995
2. James L. Antonakos, “The Pentium Microprocessor “ Pearson Education, 1997.
3. Steve Furber, ‘ ‘ ARM System –On –Chip architecture “Addison Wesley, 2000.
4. Gene .H.Miller.” Micro Computer Engineering,” Pearson Education, 2003.
5. John .B.Peatman, “Design with PIC Microcontroller, Prentice hall, 1997.
6. James L.Antonakos, An Introduction to the Intel family of Microprocessors”, PearsonEducation 1999.
7. Barry.B.Breg,” The Intel Microprocessors Architecture , Programming andInterfacing “, PHI, 2002.
8. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001  
Readings : Web links: [www.ocw.nit.edu](http://www.ocw.nit.edu),[www.arm.com](http://www.arm.com),

# LIST OF ELECTIVES

## ELECTIVE – VI (SEMESTER III)

*ELECTIVE - VI*  
*SEMESTER III*

**19271E34A SIMULATION OF COMMUNICATION NETWORKS**

**L T P C**

**300 3**

### AIM:

The aim of this course is to learn modeling and simulation.

### OBJECTIVES:

**The students should be made to be**

- Learn modeling and simulation
- Understand Monte Carlo simulation
- Study channel modeling and mobility modeling

### **UNIT I MODELLING OF COMMUNICATION SYSTEM 9**

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

### **UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9**

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

### **UNIT III ESTIMATION OF PERFORMANCE MEASURES 9**

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system, BER of digital communication systems, Monte Carlo method and Importance of sampling method, estimation of power spectral density

### **UNIT IV COMMUNICATION NETWORKS 9**

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem, M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

### **UNIT V NETWORK OF QUEUES 9**

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flowchart, Routing model, Network layout and Reliability

**TOTAL : 45 PERIODS**

### OUTCOMES:

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

- Apply Monte Carlo simulation
- Discuss Lower Layer and Link Layer Wireless Modeling
- Compare channel modeling and mobility modeling

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



## **BOOKS FOR REFERENCES:**

1. M.C.Jeruchim,PhilipBalaban and K.SamShanmugan, "Simulation of communication systems",Springer, 2nd Edition, 2002.
2. A.M.Law and W.David Kelton, "Simulation Modelling and analysis", 3rd Edition, McGraw Hill Inc.,1999.
3. J.F.Hayes, "Modeling and Analysis of Computer Communication networks (Applications ofCommunication Theory)", Plenum Press, 1984.
4. Jerry Banks and John S.Carson and Barry L. Nelson, "Discrete-Event System Simulation", 4th Edition,Prentice Hall Inc., 2004.

**19271E34B**

**MEDICAL IMAGING**

**L T P C  
3 0 0 3**

**AIM:**

To study the production of x-rays and its application to different medical Imaging techniques. To study the different types of Radio diagnostic techniques.

**OBJECTIVES:**

- To study the special imaging techniques used for visualizing the cross sections of the body.
- To study the imaging of soft tissues using ultrasound technique

**UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS 8**

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

**UNIT II COMPUTER AIDED TOMOGRAPHY 10**

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

**UNIT III RADIO ISOTOPIC IMAGING 9**

Radiation detectors, Radio isotopic imaging equipment, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

**UNIT IV ULTRASONIC SYSTEMS 9**

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

**UNIT V MAGNETIC RESONANCE IMAGING 9**

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

**TOTAL:45 PERIODS**

**OUTCOMES:**

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

- Explain computer aided tomography
- Discuss ultrasonic systems
- Outline magnetic resonance imaging

**BOOKS FOR REFERENCES:**

1. D.N.Chesney and M.O.Chesney Radiographic imaging, CBS Publications, New Delhi, 1987.
2. Peggy, W., Roger D.Ferimarch, MRI for Technologists, McGraw Hill, New York, 1995.
3. Steve Webb, The Physics of Medical Imaging, Taylor& Francis, New York.1988.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**19271E34C**

**MOBILE ADHOC NETWORKS**

**L T PC  
300 3**

**AIM:**

The aim of this course is to understand the basics of Ad-hoc & Sensor Networks.

**OBJECTIVES:**

- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

**UNIT I INTRODUCTION**

**9**

Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

**UNIT II MEDIUM ACCESS PROTOCOLS**

**9**

MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

**UNIT III NETWORK PROTOCOLS**

**9**

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

**UNIT IV END -TO - END DELIVERY AND SECURITY**

**9**

Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

**UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G**

**9**

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:-Architecture, methods of cooperation, co-operative antennas, Integration of ad hoc networks with other wired and wireless networks.

**TOTAL : 45 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students should be able to**

- Identify different issues in wireless ad hoc and sensor networks.
- To analyze protocols developed for ad hoc and sensor networks.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- To identify and address the security threats in ad hoc and sensor networks.
- Establish a Sensor network environment for different types of applications.

### **BOOKS FOR REFERENCES:**

1. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks Architectures and protocols”, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, “Adhoc Networking”, Addison – Wesley, 2000.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, “Mobile Ad Hoc networking”, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, “The handbook of adhoc wireless networks”, CRC press,2002.
5. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad Hoc Network Research,” Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2,no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , “A survey of integrating IP mobility protocols and Mobile Ad hoc networks”, IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”, Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, ” ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”, World Wireless cong., San Francisco, CA,May 2004.



# **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
<b>TOTAL CREDITS</b>						<b>29</b>

## 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
<b>TOTAL CREDITS</b>						<b>29</b>

# 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
<b>TOTAL CREDITS</b>						<b>23</b>

### 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
<b>TOTAL CREDITS</b>						<b>26</b>

## 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
<b>TOTAL CREDITS</b>						<b>26</b>

## 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
<b>TOTAL CREDITS</b>						<b>23</b>

## 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
<b>TOTAL CREDITS</b>						<b>26</b>

## 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
<b>TOTAL CREDITS</b>						<b>20</b>

\*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
<b>Over ALL Credits</b>							<b>200</b>

## NON CGPA CREDITS

Semester	Add on course	Total
I	01	<b>01</b>
II	01	<b>01</b>
III	-	-
IV	-	-
V	-	-
VI	-	-
VII	-	-
VIII	-	-
Co curricular Activities	In-plant Training , Industrial Visit , Seminars & Conferences	<b>03</b>
<b>TOTAL NON-CGPA CREDITS</b>		<b>05</b>

<b>TOTAL CREDITS</b>	
CGPA CREDITS	<b>200</b>
NON-CGPA CREDITS	<b>05</b>
<b>TOTAL</b>	<b>205</b>

# 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

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>5</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> 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, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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", 12<sup>th</sup> Edition, Pearson India, 2016.

17149S13

**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 conductions 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.



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 – H<sub>2</sub>-O<sub>2</sub> 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, 50<sup>th</sup> 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, 2<sup>nd</sup> 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'', 2<sup>nd</sup> 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.

<b>17150L17</b>	<b>PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY</b>	<b>LT P C 0 0 3 2</b>
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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 Na<sub>2</sub>CO<sub>3</sub> 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 (8<sup>TH</sup> 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, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> 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, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3<sup>rd</sup> 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, 4<sup>th</sup> 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&amp;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

**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', 2<sup>nd</sup> 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", 43<sup>rd</sup> 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", 9<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3<sup>rd</sup> 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.

**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

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' 4<sup>th</sup> 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, 3<sup>rd</sup> Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3<sup>rd</sup> 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, 5<sup>th</sup> edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7<sup>th</sup> Ed., Oxford University Press

**REFERENCES:**

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2<sup>nd</sup> edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10<sup>th</sup> 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", 9<sup>th</sup> Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10<sup>th</sup> 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, 6<sup>th</sup> Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2<sup>nd</sup> Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3<sup>rd</sup> Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5<sup>th</sup> Edition, 2015.

<b>17153C42</b>	<b>ELECTRICAL MACHINES – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>2</b>	<b>0</b>	<b>3</b>

**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' 4<sup>th</sup> 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, 3<sup>rd</sup> 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 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

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.

<b>17153C45</b>	<b>LINEAR INTEGRATED CIRCUITS AND APPLICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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  $\mu$ P8085 &  $\mu$ 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  $120^\circ$  mode and  $180^\circ$  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, 6<sup>th</sup> 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

#### 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

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”, 8<sup>th</sup> Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9<sup>th</sup> Edition, Prentice Hall, 2013.

**REFERENCES**

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3<sup>rd</sup> 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 ,6<sup>th</sup> edition, Pearson Education ,2015
5. N.K. De., P.K. SEN" Electric drives" PHI, 2012.

<b>17153C62</b>	<b>PROTECTION AND SWITCHGEAR</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, SF<sub>6</sub>, 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.

**17153C63****EMBEDDED SYSTEMS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 (I<sup>2</sup>C) –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 $\Phi$  & 3 $\Phi$  semi converters, 1 $\Phi$  & 3 $\Phi$  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.

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.

17153C72

### POWER SYSTEM OPERATION AND CONTROL

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

#### 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.



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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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

<b>RENEWABLE ENERGY SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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	

<b>Consumabilitys (Minimum of 5 Nos. each)</b>			
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", 4<sup>th</sup> 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, 3<sup>rd</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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

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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>17153E64F</b>	<b>INTELLECTUAL PROPERTY RIGHTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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”, 3<sup>rd</sup> 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.

<b>17153E75C</b>	<b>OPERATIONS RESEARCH</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 8<sup>th</sup> Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4<sup>th</sup> Edition, 2007.

**REFERENCES :**

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4<sup>th</sup> Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3<sup>rd</sup> 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, 8<sup>th</sup> 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 ( $\theta_a$ ), 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/>

<b>17153E81A</b>	<b>FLEXIBLE AC TRANSMISSION SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>17153E81E</b>	<b>ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>17153E81F</b>	<b>PROFESSIONAL ETHICS IN ENGINEERING</b>	<b>L T P C 3 0 0 3</b>
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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.

<b>UNIT I</b>	<b>HUMAN VALUES</b>	<b>10</b>
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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.

<b>UNIT II</b>	<b>ENGINEERING ETHICS</b>	<b>9</b>
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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.

<b>UNIT III</b>	<b>ENGINEERING AS SOCIAL EXPERIMENTATION</b>	<b>9</b>
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Engineering as Experimentation – Engineers as responsible Experimenters – Codes of Ethics – A Balanced Outlook on Law.

<b>UNIT IV</b>	<b>SAFETY, RESPONSIBILITIES AND RIGHTS</b>	<b>9</b>
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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](http://www.onlineethics.org)
2. [www.nspe.org](http://www.nspe.org)
3. [www.globalethics.org](http://www.globalethics.org)
4. [www.ethics.org](http://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., 10<sup>th</sup> 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”, 7<sup>th</sup> Edition, Pearson Education, 2011.
4. Tripathy PC & Reddy PN, “Principles of Management”, Tata McGraw Hill, 1999

<b>17153E82A</b>	<b>ENERGY MANAGEMENT AND AUDITING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 1<sup>st</sup> 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. New Delhi, 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.

<b>17153E82D</b>	<b>MICROCONTROLLER BASED SYSTEM DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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**

I<sup>2</sup>C 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,3<sup>rd</sup>Edition, 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**

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**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 pCO<sub>2</sub>, pO<sub>2</sub>, 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, 2<sup>nd</sup> edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John

Wiley and sons, New York, 4<sup>th</sup> 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, TiO<sub>2</sub>, MgO, ZrO<sub>2</sub>, NiO, nanoalumina, CaO, AgTiO<sub>2</sub>, 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:**

- | | 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**  
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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

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- 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
<b>1</b>	3	3	2	3	2	1	1	2	1	1	3	1	3
<b>2</b>	3	3	3	3	3	1	1	1	1	1	1	2	2
<b>3</b>	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
<b>PRACTICAL</b>						
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				-
<b>TOTAL CREDITS</b>						<b>25</b>

## 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
<b>PRACTICAL</b>						
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				-
<b>TOTAL CREDITS</b>						<b>25</b>

### 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
<b>PRACTICAL</b>						
7	19153L37	Electronics Laboratory	0	0	3	2
8	19153L38	Electrical Machines Laboratory - I##	0	0	3	2
<b>TOTAL CREDITS</b>						<b>28</b>

### 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
<b>PRACTICAL</b>						
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
<b>TOTAL CREDITS</b>						<b>30</b>

## 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
<b>PRACTICAL</b>						
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
<b>RESEARCH SKILL DEVELOPMENT (RSD) COURSE</b>						
10	19153CRM	Research Methodology	3	0	0	3
<b>TOTAL CREDITS</b>						<b>31</b>

## 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
<b>PRACTICAL</b>						
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
<b>RESEARCH SKILL DEVELOPMENT (RSD) COURSE</b>						
9	19153CBR	Participation in Bounded Research	0	0	3	2
<b>TOTAL CREDITS</b>						<b>26</b>

## 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
<b>PRACTICAL</b>						
7	19153L77	Power System Simulation Laboratory###	0	0	3	2
8	19153L78	Renewable Energy Systems Laboratory	0	0	3	2
<b>RESEARCH SKILL DEVELOPMENT (RSD) COURSE</b>						
9	19153CSR	Participation in Scaffolded Research (Design / Socio Technical Project)	0	0	5	5
<b>TOTAL CREDITS</b>						<b>30</b>

## 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
<b>PRACTICAL</b>						
3.	19153P81	Project Work	!	!	!	15
4.	19153PEE	Programme Exit Examination				2
<b>TOTAL CREDITS</b>						<b>23</b>
<b>TOTAL NO.OF CREDITS =226</b>						

\*\* 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
<b>TOTAL CREDITS</b>													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, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> 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, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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", 12<sup>th</sup> 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 – H<sub>2</sub>-O<sub>2</sub> 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, 50<sup>th</sup> 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, 2<sup>nd</sup> 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'', 2<sup>nd</sup> 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.

<b>19150L17</b>	<b>PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY</b>	<b>LT P C 0 0 3 2</b>
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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)

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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<sub>2</sub>CO<sub>3</sub> 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 (8<sup>TH</sup> 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.
2. Listen and comprehend lectures and talks in their area of specialisation successfully.
3. Speak appropriately and effectively in varied formal and informal contexts.
4. 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> 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, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., " Advanced Engineering Mathematics ", Narosa Publications, New Delhi , 3<sup>rd</sup> 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, 4<sup>th</sup> 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&amp;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', 2<sup>nd</sup> 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 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.

**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	

<b>19153L28C</b>	<b>ELECTRIC CIRCUITS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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", 43<sup>rd</sup> 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", 9<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3<sup>rd</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>

**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



**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' 4<sup>th</sup> 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, 3<sup>rd</sup> Edition, Reprint 2015.
3. S.K. Bhattacharya, 'Electrical Machines' McGraw - Hill Education, New Delhi, 3<sup>rd</sup> 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, 5<sup>th</sup> edition 2008.
2. Sedra and smith, “Microelectronic circuits”,7<sup>th</sup> Ed., Oxford University Press

**REFERENCES:**

1. Balbir Kumar, Shail.B.Jain, “Electronic devices and circuits” PHI learning private limited, 2<sup>nd</sup> edition 2014.
2. Thomas L.Floyd, “Electronic devices” Conventional current version, Pearson prentice hall, 10<sup>th</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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

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", 9<sup>th</sup> Edition, Cengage Learning, 2016.
2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10<sup>th</sup> 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, 6<sup>th</sup> Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2<sup>nd</sup> Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3<sup>rd</sup> Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5<sup>th</sup> Edition, 2015.

<b>19153C42</b>	<b>ELECTRICAL MACHINES – II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>

**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' 4<sup>th</sup> 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, 3<sup>rd</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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.

**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.

**19153C45      LINEAR INTEGRATED CIRCUITS AND APPLICATIONS      L   T   P   C**  
**3   1   0   4**

**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.

<b>19153C46</b>	<b>CONTROL SYSTEMS</b>	<b>L T P C</b>
		<b>2 2 0 4</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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.

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	
<b>Consumabilitys (sufficient quantity)</b>			
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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**OBJECTIVES:**

To impart knowledge on the following Topics

- | Architecture of  $\mu$ P8085 &  $\mu$ 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&amp; control instructions – Programming: Loop structure with counting &amp; 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&amp; 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, 6<sup>th</sup> 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”, 8<sup>th</sup> Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9<sup>th</sup> Edition, Prentice Hall, 2013.

**REFERENCES**

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3<sup>rd</sup> 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.

<b>19153L57</b>	<b>CONTROL AND INSTRUMENTATION LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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

<b>19153L58</b>	<b>OBJECT ORIENTED PROGRAMMING LABORATORY</b>	<b>L T P C 0 0 3 2</b>
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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", 6<sup>th</sup> 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 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.

**19153C63****EMBEDDED SYSTEMS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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 (I<sup>2</sup>C) –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 $\Phi$  & 3 $\Phi$  semi converters, 1 $\Phi$  & 3 $\Phi$  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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**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	

<b>Consumabilitys (Minimum of 5 Nos. each)</b>			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

<b>19153P83PW</b>	<b>PROJECT WORK</b>	<b>L T P C</b>
		<b>0 0 0 15</b>

**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.

<b>19153PEE -</b>	<b>PROGRAMME EXIT EXAMINATION</b>	<b>L T P C</b>
		<b>0 0 0 2</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>19153E64D</b>	<b>INTELLECTUAL PROPERTY RIGHTS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVE:**

- 1. To give an idea about IPR, registration and its enforcement.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
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.		
<b>UNIT II</b>	<b>REGISTRATION OF IPRs</b>	<b>10</b>
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad		
<b>UNIT III</b>	<b>AGREEMENTS AND LEGISLATIONS</b>	<b>10</b>
International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.		
<b>UNIT IV</b>	<b>DIGITAL PRODUCTS AND LAW</b>	<b>9</b>
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.		
<b>UNIT V</b>	<b>ENFORCEMENT OF IPRs</b>	<b>7</b>
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.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.

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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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****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.

<b>19153E75C</b>	<b>OPERATIONS RESEARCH</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

19153E75D

**PROBABILITY AND STATISTICS**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 8<sup>th</sup> Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4<sup>th</sup> Edition, 2007.

**REFERENCES :**

1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8<sup>th</sup> Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4<sup>th</sup> Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3<sup>rd</sup> 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, 8<sup>th</sup> Edition, 2007.

<b>19153E76A</b>	<b>SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 3<sup>rd</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 2<sup>nd</sup> 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.

<b>19153E76D</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**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", 8<sup>th</sup> 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

<b>19153E81A</b>	<b>FLEXIBLE AC TRANSMISSION SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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

<b>19153E81C</b>	<b>SMPS AND UPS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>19153E81D</b>	<b>ELECTRIC ENERGY GENERATION, UTILIZATION CONSERVATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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, 1<sup>st</sup> 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**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 pCO<sub>2</sub>, pO<sub>2</sub>, 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, 2<sup>nd</sup> edition, 2003
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, JohnWiley and sons, New York, 4<sup>th</sup> 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.





# PRIST UNIVERSITY

VALLAM, THANJAVUR.

DEPARTMENT OF  
ELECTRICAL & ELECTRONICS  
ENGINEERING

COURSE STRUCTURE

B.TECH EEE (PART TIME)

[REGULATION 2017]

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

**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	

### 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", 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

## 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 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**

**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, $\pi$ , 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, 4<sup>th</sup> 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.

**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. 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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# 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, 4<sup>th</sup> edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2<sup>nd</sup> 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, 3<sup>rd</sup> Edition, New Delhi, 2004.

2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3<sup>rd</sup> 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 SF<sub>6</sub> 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

# 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.

**#####**

**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.

<b>UNIT 1</b>	<b>9</b>
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.	
<b>UNIT 2</b>	<b>9</b>
Static Relay Circuits (Using Analog and Digital IC’s) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.	
<b>UNIT 3</b>	<b>9</b>
Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.	
<b>UNIT 4</b>	<b>9</b>
Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.	
<b>UNIT 5</b>	<b>9</b>
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  $\lambda$ -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 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 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



<b>UNIT I</b>	<b>9</b>
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.	
<b>UNIT II</b>	<b>9</b>
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.	
<b>UNIT III</b>	<b>9</b>
Sampling theorem, PAM, PWM, PPM, Pulse Code Modulation, Noise in PCM, Delta Modulation, Adaptive Delta modulation, DPCM, M'ary system, FDM and TDM.	
<b>UNIT IV</b>	<b>9</b>
Digital Modulation, ASK, FSK, PSK, DPSK, Basic Principles of Optical Communication, Satellite Comm., Mobile Comm.	
<b>UNIT V</b>	<b>9</b>
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**

- 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**

**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', 3<sup>rd</sup> 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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**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.



**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 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
<b>Total No of</b>						<b>19</b>

**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
<b>Total No of Credits</b>						<b>19</b>

**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
<b>Total No of Credits</b>						<b>18</b>

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
<b>Total No of Credits</b>						<b>18</b>

## 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
<b>Total No of Credits</b>						<b>18</b>

## 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
<b>Total No of Credits</b>						<b>18</b>

**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
<b>Total No of Credits</b>						<b>20</b>

### 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

### 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, 4<sup>th</sup> 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.

**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.

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# 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, 4<sup>th</sup> edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2<sup>nd</sup> 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, 3<sup>rd</sup> Edition, New Delhi, 2004.
2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3<sup>rd</sup> 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 SF<sub>6</sub> and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers





## **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.

## 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.

<b>UNIT 1</b>	<b>9</b>
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.	
<b>UNIT 2</b>	<b>9</b>
Static Relay Circuits (Using Analog and Digital IC’s) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.	
<b>UNIT 3</b>	<b>9</b>
Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.	
<b>UNIT 4</b>	<b>9</b>
Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.	
<b>UNIT 5</b>	<b>9</b>
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  $\lambda$ -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 – Dearearators – 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

### 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 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 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.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.

**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 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 - 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

<b>UNIT I</b>	<b>TRANSMISSION ENGINEERING</b>	<b>9</b>
Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.		
<b>UNIT II</b>	<b>LINE PARAMETER</b>	<b>9</b>
Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.		
<b>UNIT III</b>	<b>POWER CONTROL</b>	<b>9</b>
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.		
<b>UNIT IV</b>	<b>EHV AC Transmission</b>	<b>9</b>
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.		
<b>UNIT V</b>	<b>HVDC TRANSMISSION</b>	<b>9</b>
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.		
		<b>Total=45</b>

### 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', 3<sup>rd</sup> 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.
-

**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
<b>Research Skill Development (RSD) Course</b>						
8.	19253CRS	Research Led Seminar				1
<b>TOTAL</b>						<b>27</b>

**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
<b>Research Skill Development (RSD) Course</b>						
8.	19253CRM	Research Methodology	3	0	0	3
9.	19253CBR	Participation in Bounded Research	2	0	0	2
<b>TOTAL</b>						<b>29</b>

### 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
<b>Research Skill Development (RSD) Course</b>						
6.	19253CSR	Design / Socio Technical Project	0	0	6	6
<b>TOTAL</b>						<b>29</b>

### SEMESTER – IV

S.NO.	COURSE CODE	SUBJECT	L	T	P	C
1.	19253P41	Project work Phase - II	0	0	15	15
<b>TOTAL</b>						<b>15</b>

**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
<b>Total Credits</b>											<b>100</b>

\*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](http://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 Cerkov 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.

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**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

<b>19272E33C</b>	<b>CONTROL SYSTEM DESIGN FOR POWER ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>UNIT I</b>	<b>MODELLING OF DC-TO-DC POWER CONVERTERS</b>	<b>9</b>
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.		

<b>UNIT II</b>	<b>SLIDING MODE CONTROLLER DESIGN</b>	<b>9</b>
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.		

<b>UNIT III</b>	<b>APPROXIMATE LINEARIZATION CONTROLLER DESIGN</b>	<b>9</b>
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.		

<b>UNIT IV</b>	<b>NONLINEAR CONTROLLER DESIGN</b>	<b>9</b>
Feedback Linearization Isidori's Canonical Form, Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced Order Observers.		

<b>UNIT V</b>	<b>PREDICTIVE CONTROL OF POWER CONVERTERS</b>	<b>9</b>
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, Vasilios 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, 2<sup>nd</sup>, 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. 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.

## **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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**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.

 **$L = 45 \quad T = 15 \quad P = 0 \quad C = 4$** **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.

**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](http://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.

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**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.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
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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# **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](http://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](http://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.Bimbira, “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.

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**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

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# **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
<b>Research Skill development course (RSD course)</b>						
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
<b>Research Skill development course (RSD course)</b>						
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
<b>Research Skill development course (RSD course)</b>						
5	19272CSR	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
<b>Total Credits</b>										<b>100</b>	

\*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](http://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.

 **$L = 45$   $T = 15$   $P = 0$   $C = 4$** **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](http://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.



**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.

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**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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THANJAVUR – 613 403 - TAMIL NADU

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT**

**OF**

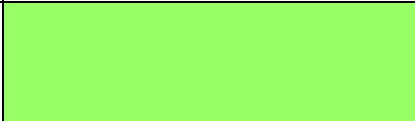


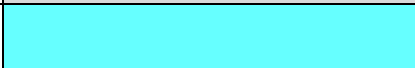
**COMPUTER SCIENCE AND ENGINEERING**

**PROGRAM HANDBOOK**

**B.TECH – FULL TIME**

**[REGULATION 2019]**

## LEGEND

1.1.3	COLOUR
SKILL DEVELOPMENT	
EMPLOYABILITY	
EMPLOYABILITY / SKILL DEVELOPMENT	
ENTREPRENEURSHIP	

# **COURSE STRUCTURE**

**I - VIII SEMESTERS CURRICULUM AND SYLLABI  
B.TECH (FT) CSE [REGULATION 2019]**

**SEMESTER I**

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
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
<b>PRACTICAL</b>						
7.	19150L17	Problem Solving and Python Programming Lab	0	0	4	2
8.	19149L18	Physics and Chemistry Laboratory	0	0	4	2
9.	191VEA19	Value Education				-
<b>TOTAL</b>			<b>19</b>	<b>0</b>	<b>12</b>	<b>25</b>

**SEMESTER II**

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19147S21	Technical English	4	0	0	4
2	19148S22	Engineering Mathematics – II	4	0	0	4
3	19149S23A	Physics for Information Science	3	0	0	3
4	19149S24A	Environmental Science And Engineering	3	0	0	3
5	19153S25A	Basic Electrical, Electronics And measurement Engineering	3	0	0	3
6	19150S26A	Programming in C	3	2	0	4
<b>PRACTICAL</b>						
7	19154L27	Engineering Practices Lab	0	0	4	2
8	19150L28A	C Programming Lab	0	0	4	2
9	191ICA29	Fundamentals of Indian constitution and Economy				-
<b>TOTAL</b>			<b>20</b>	<b>2</b>	<b>8</b>	<b>25</b>

**SEMESTER III**

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19148S31A	Discrete Mathematics	4	0	0	4
2.	19150S32	Digital Principles and System Design	4	0	0	4
3.	19150C33	Data Structures	3	0	0	3
4.	19150C34	Object Oriented Programming	3	0	0	3
5.	19150S35	Communication Engineering	3	0	0	3
<b>PRACTICAL</b>						
6.	19150L36	Data Structures Laboratory	0	0	4	2
7.	19150L37	Object Oriented Programming Laboratory	0	0	4	2
8.	19150L38	Digital Systems Laboratory	0	0	4	2
9.	19150L39	Interpersonal Skills/Listening &Speaking	0	0	2	1
<b>TOTAL</b>			<b>17</b>	<b>0</b>	<b>14</b>	<b>24</b>

#### SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19148S41A	Probability and Queuing Theory	4	0	0	4
2	19150C42	Computer Architecture	3	0	0	3
3	19150C43	Database Management Systems	3	0	0	3
4	19150C44	Design and Analysis of Algorithms	3	0	0	3
5	19150C45	Operating Systems	3	0	0	3
6	19150C46	Software Engineering	3	0	0	3
<b>PRACTICAL</b>						
7	19150L47	Database Management Systems Laboratory	0	0	4	2
8	19150L48	Operating Systems Laboratory	0	0	4	2
9	19150L49	Advanced Reading and Writing	0	0	2	1
<b>Research Skill Based (RSB) Course</b>						
10	19150CRS	Research Led Seminar				1
<b>TOTAL</b>			<b>19</b>	<b>0</b>	<b>10</b>	<b>25</b>

#### SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19148S51A	Algebra and Number Theory	4	0	0	4

2	19150C52	Computer Networks	3	0	0	3
3	19150C53	Microprocessors and Microcontrollers	3	0	0	3
4	191__OE54__	Open Elective – I	3	0	0	3
5	19150C55	Theory of Computation	3	0	0	3
6	19150C56	Object Oriented Analysis and Design	3	0	0	3
<b>PRACTICAL</b>						
7	19150L57	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8	19150L58	Object Oriented Analysis and Design Laboratory	0	0	4	2
9	19150L59	Networks Laboratory	0	0	4	2
<b>Research Skill Based (RSB) Course</b>						
10	19150CRM	Research Methodology	3	0	0	3
<b>TOTAL</b>			<b>22</b>	<b>0</b>	<b>12</b>	<b>28</b>

### SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150C61	Internet Programming	3	0	0	3
2	19150C62	Artificial Intelligence	3	0	0	3
3	19150C63	Mobile Computing	3	0	0	3
4	19150C64	Compiler Design	3	2	0	4
5	19150C65	Distributed Systems	3	0	0	3
6	19150E66__	Elective - I	3	0	0	3
<b>PRACTICAL</b>						
7	19150L61	Internet Programming Laboratory	0	0	4	2
8	19150L62	Mobile Application Development Laboratory	0	0	4	2
9	19150L63	Mini Project	0	0	4	2
10	19150L64	Professional Communication	0	0	2	1
<b>Research Skill Based (RSB) Course</b>						
11	19150CBR	Participation in Bounded Research				1
<b>TOTAL</b>			<b>18</b>	<b>2</b>	<b>14</b>	<b>27</b>

### SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150S71	Principles of Management	3	0	0	3
2	19150C72	Cryptography and Network Security	3	0	0	3
3	19150C73	Cloud Computing	3	0	0	3

4	191__OE74__	Open Elective – II	3	0	0	3
5	19150E75__	Elective – II	3	0	0	3
6	19150E76__	Elective – III	3	0	0	3
<b>PRACTICAL</b>						
7	19150L77	Cloud Computing Laboratory	0	0	4	2
8	19150L78	Security Laboratory	0	0	4	2
<b>Research Skill Based (RSB) Course</b>						
9	19150CSR	Design / Socio-Technical Project				3
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>8</b>	<b>25</b>

#### SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E81__	Elective – IV	3	0	0	3
2	19150E82__	Elective – V	3	0	0	3
<b>PRACTICAL</b>						
3	19150P83	Project Work	0	0	20	10
4	19150PEE	Program Exit Examination				2
<b>TOTAL</b>			<b>6</b>	<b>0</b>	<b>20</b>	<b>18</b>

#### ELECTIVE I (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E66A	Data Warehousing and Data Mining	3	0	0	3
2	19150E66B	Software Testing	3	0	0	3
3	19150E66C	Embedded Systems	3	0	0	3
4	19150E66D	Graph Theory and Applications	3	0	0	3
5	19150E66E	Digital Signal Processing	3	0	0	3

#### ELECTIVE II (SEMESTER VII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E75A	Big Data Analytics	3	0	0	3
2	19150E75B	Machine Learning Techniques	3	0	0	3
3	19150E75C	Software Project Management	3	0	2	3
4	19150E75D	Internet of Things	3	0	0	3
5	19150E75E	Service Oriented Architecture	3	0	0	3

**ELECTIVE III (SEMESTER VII)**

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E76A	Multi-core Architectures and Programming	3	0	0	3
2	19150E76B	Human Computer Interaction	3	0	0	3
3	19150E76C	C# and .Net Programming	3	0	0	3
4	19150E76D	Wireless Adhoc and Sensor Networks	3	0	2	3
5	19150E76E	Advanced Topics on Databases	3	0	0	3

**ELECTIVE IV (SEMESTER VIII)**

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E81A	Digital Image Processing	3	0	0	3
2	19150E81B	Social Network Analysis	3	0	0	3
3	19150E81C	Information Security	3	0	0	3
4	19150E81D	Cyber Forensics	3	0	0	3
5	19150E81E	Soft Computing	3	0	0	3

**ELECTIVE V (SEMESTER VIII)**

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1	19150E82A	Information Retrieval Techniques	3	0	0	3
2	19150E82B	Natural Language Processing	3	0	2	3
3	19150E82C	Parallel Algorithms	3	0	0	3
4	19150E82D	Speech Processing	3	0	0	3
5	19150E82E	Fundamentals of Nano Science	3	0	0	3

**OPENELECTIVE I (SEMESTER V)**

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	ECE	19152OE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
2.		19152OE54B	Sensors And Transducers	3	0	0	3
3.	EEE	19153OE54A	Industrial Nano Technology	3	0	0	3
4.		19153OE54B	Energy Conservation and Management	3	0	0	3
5.	MECH	19154OE54A	Renewable energy sources	3	0	0	3
6.		19154OE54B	Automotive Systems	3	0	0	3
7.	CIVIL	19155OE54A	Air Pollution And Control Engineering	3	0	0	3



8.		19155OE54B	Geographic Information Systems	3	0	0	3
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**OPENELECTIVE II (SEMESTER VII)**

<b>Sl. No</b>	<b>DEPT</b>	<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
1.	ECE	19152OE74A	Robotics	3	0	0	3
2.		19152OE74B	Electronic Devices	3	0	0	3
3.	EEE	19153OE74A	Basic Circuit Theory	3	0	0	3
4.		19153OE74B	Introduction To Renewable Energy Systems	3	0	0	3
5.	MECH	19154OE74A	Industrial Safety	3	0	0	3
6.		19154OE74B	Testing Of Materials	3	0	0	3
7.	CIVIL	19155OE74A	Green Building Design	3	0	0	3
8.		19155OE74B	Waste Water Treatment	3	0	0	3

**TOTAL CREDITS - 197**

**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.

**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. CengageLearning ,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.

19148S12

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, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> 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, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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", 12<sup>th</sup> 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 conductions 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.

19149S14

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 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 - H<sub>2</sub>-O<sub>2</sub> 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.

19150S16

## PROBLEM SOLVING AND 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", 2<sup>nd</sup> 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.



**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.
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, 50<sup>th</sup> 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, 2<sup>nd</sup> 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

19150L17      **PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**      **LT PC**  
**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.

#### TOTAL: 60 PERIODS

- 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.

19149L18

#### PHYSICS AND CHEMISTRY LABORATORY

(Common to all branches of B.E. / B.Tech Programmes)

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
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

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<sub>2</sub>CO<sub>3</sub> 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**

#### TEXTBOOK:

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

**19147S21**

**TECHNICAL ENGLISH**

L	T	P	C
4	0	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 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-** 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. 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  $w = z + c, cz, z^2$  - 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:

- Eigen values 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, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10<sup>th</sup> 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, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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, 4<sup>th</sup> Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> Edition, New Delhi, 2012.

19149S23

A

## PHYSICS FOR INFORMATION SCIENCE (Common to CSE & IT)

L T P C  
3 0 0 3

### 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

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 - 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 band gap 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

9

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

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 - LED - Organic LED - Laser diodes - Optical data storage techniques.

**UNIT V NANO DEVICES****9**

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 :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 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..

**TEXT BOOKS:**

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.

<b>19153S25A</b>	<b>BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**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****9**

Ohms Law, **Kirchhoff's Law**-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - **nodal analysis, mesh analysis**- network theorems Thevenins 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****9**

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 9**  
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 9**  
PN Junction-VI Characteristics of Diode, zener diode, Transistors 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 9**  
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: 45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the students will 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.

**TEXT BOOKS:**

1. D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engineering, Mc Graw 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, Fundaments 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.

**17149S24A ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C  
3 0 0 3**

**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.

<b>UNIT I</b>	<b>ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY</b>	<b>14</b>
Definition, scope and importance of environment - <b>need for public awareness</b> concept of an ecosystem - <b>structure and function of an ecosystem</b> - 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) - <b>Introduction to biodiversity definition</b> : 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, <b>poaching of wildlife</b> , man-wildlife conflicts - <b>endangered and endemic species of India</b> - <b>conservation of biodiversity</b> : 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.		
<b>UNIT II</b>	<b>ENVIRONMENTAL POLLUTION</b>	<b>8</b>
Definition - causes, effects and control measures of: (a) <b>Air pollution</b> (b) Water pollution (c) Soil pollution (d) Marine pollution (e) <b>Noise pollution</b> (f) Thermal pollution (g) Nuclear hazards - solid waste management: causes, effects and <b>control measures of municipal</b> 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.		
<b>UNIT III</b>	<b>NATURAL RESOURCES</b>	<b>10</b>
Forest resources: Use and over-exploitation, deforestation, case studies- <b>timber extraction</b> , 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 - <b>Food resources</b> : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies - <b>Energy resources</b> : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies - Land resources: <b>Land as a resource</b> , 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 - <b>river / forest / grassland / hill / mountain</b> .		
<b>UNIT IV</b>	<b>SOCIAL ISSUES AND THE ENVIRONMENT</b>	<b>7</b>
From unsustainable to sustainable development - urban problems related to energy - water conservation, rain water harvesting, watershed management - resettlement and rehabilitation of people; <b>its problems and concerns</b> , case studies - role of non-governmental organization- environmental ethics: Issues and possible solutions - <b>climate change</b> , global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. - wasteland reclamation - <b>consumerism and waste products</b> - environment production act - Air (Prevention and Control of Pollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forest conservation act - <b>enforcement machinery involved in environmental legislation</b> - central and state pollution control boards- Public awareness.		
<b>UNIT V</b>	<b>HUMAN POPULATION AND THE ENVIRONMENT</b>	<b>6</b>
Population growth, variation among nations - <b>population explosion</b> - family welfare programme - environment and human health - human rights - value education - HIV / AIDS - women and child welfare - <b>role of information technology in environment and human health</b> - Case studies.		

**TOTAL: 45 PERIODS**



## UNIT IV STRUCTURES

9

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

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

### OUTCOMES:

Upon completion of the course, the students will 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.

### TEXT BOOKS:

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.

19154L27

ENGINEERING PRACTICES LABORATORY

L T P C  
0 0 4 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.

**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   |
| (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 centurion 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:
    - a. Find the total number of words.
    - b. Capitalize the first word of each sentence.
    - c. 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.
- Mini project**
18. Create a `^Railway reservation system|` with the following modules
    - Booking
    - Availability checking
    - Cancellation
    - Prepare chart

**TOTAL: 60 PERIODS**

**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.
- Design applications using sequential and random access file processing.

<b>19148C31A</b>	<b>DISCRETE MATHEMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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 and 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 - Semi groups 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 BOOK:**

1. M. Morris R. Mano, Michael D. Ciletti, Digital Design: With an Introduction to the Verilog HDL, VHDL, and SystemVerilog, 6<sup>th</sup> 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 Mc Graw Hill, 2003.

<b>19150C33</b>	<b>DATA STRUCTURES</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**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

19150C34

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****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, 8<sup>th</sup> Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, Core Java Volume -I Fundamentals, 9<sup>th</sup> Edition, Prentice Hall, 2013.

**REFERENCES:**

1. Paul Deitel, Harvey Deitel, Java SE 8 for programmers, 3<sup>rd</sup> 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.

**19150C35****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

**UNITII 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,

**TOTAL: 45 PERIODS****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|| 3/e, TMH 2007
2. S. Haykin Digital Communications|| John Wiley 2005

**REFERENCES:**

1. B.P.Lathi, Modern Digital and Analog Communication Systems||, 3<sup>rd</sup> edition, Oxford University Press, 2007
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.

**19150L36****DATA STRUCTURES LABORATORY****L T P C  
0 0 4 2****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
1. Array implementation of Stack and Queue ADTs
  2. Array implementation of List ADT
  3. Linked list implementation of List, Stack and Queue ADTs
  4. Applications of List, Stack and Queue ADTs
  5. Implementation of Binary Trees and operations of Binary Trees
  6. Implementation of Binary Search Trees
  7. Implementation of AVL Trees
  8. Implementation of Heaps using Priority Queues.
  9. Graph representation and Traversal algorithms
  10. Applications of Graphs
  11. Implementation of searching and sorting algorithms
  12. Hashing - any two collision techniques

**TOTAL: 60 PERIODS**

## OUTCOMES:

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

- Write functions to implement linear and non-linear data structure operations
- Suggest appropriate linear / non-linear data structure operations for solving a given problem
- Appropriately use the linear / non-linear data structure operations for a given problem
- Apply appropriate hash functions that result in a collision free scenario for data storage and retrieval

19150L37

OBJECT ORIENTED PROGRAMMING LABORATORY

L T P C  
0 0 4 2

## 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.

**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.

<b>19150L38</b>	<b>DIGITAL SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

## 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:
  - 4 - bit binary adder / subtractor
  - Parity generator / checker
  - Magnitude Comparator
  - 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 BATCH OF 30 STUDENTS HARDWARE:**

1. Digital trainer kits - 30
2. Digital ICs required for the experiments in sufficient numbers

**SOFTWARE:**

1. HDL simulator.

<b>19150L39</b>	<b>INTERPERSONAL SKILLS/LISTENING&amp;SPEAKING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

**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, 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

**19148S41A**

**PROBABILITY AND QUEUING THEORY**

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 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.

<b>UNIT I</b>	<b>PROBABILITY AND RANDOM VARIABLES</b>	<b>12</b>
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.		
<b>UNIT II</b>	<b>TWO - DIMENSIONAL RANDOM VARIABLES</b>	<b>12</b>
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).		
<b>UNIT III</b>	<b>RANDOM PROCESSES</b>	<b>12</b>
Classification - Stationary process - Markov process - Poisson process - Discrete parameter Markov chain - Chapman Kolmogorov equations - Limiting distributions.		
<b>UNIT IV</b>	<b>QUEUEING MODELS</b>	<b>12</b>
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.		
<b>UNIT V</b>	<b>ADVANCED QUEUEING MODELS</b>	<b>12</b>
Finite source models - M/G/1 queue - Pollaczek Khinchin formula M/D/1 and M/E <sub>K</sub> /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 probabilistic manner

**TEXTBOOKS:**

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., "Fundamentals of Queueing Theory", Wiley Student 4<sup>th</sup> Edition, 2014.
2. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 1<sup>st</sup> 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", 9<sup>th</sup> Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2<sup>nd</sup> Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2<sup>nd</sup> 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.

**UNIT I BASIC STRUCTURE OF A COMPUTER SYSTEM 9**

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 PARALLELISIM 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:**

**On Completion of the course, the students should be able to:**

- Understand the basics 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.

**TEXT BOOKS:**

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.

<b>19150C43</b>	<b>DATABASE MANAGEMENT SYSTEMS</b>	<b>L T P C</b> <b>3 0 0 3</b>
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## 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 10

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 8

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:**

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

- 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.

**TEXT BOOKS:**

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.

<b>19150C44</b>	<b>DESIGN AND ANALYSIS OF ALGORITHMS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**OBJECTIVES:**

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand different 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  $a^n$  - 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 different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency.

**TEXT BOOKS:**

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2007.

**REFERENCES:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.
3. Harsh Bhasin, Algorithms Design and Analysis, Oxford university press, 2016.
4. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
5. <http://nptel.ac.in/>

**19150C45****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, 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**

### 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.

### TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9<sup>th</sup> 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:**

- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures

**UNIT I SOFTWARE PROCESS AND AGILE DEVELOPMENT 9**

Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models -Introduction to Agility-Agile process-Extreme programming-XP Process.

**UNIT II REQUIREMENTS ANALYSIS AND SPECIFICATION 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.

**UNIT III SOFTWARE DESIGN 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.

**UNIT IV TESTING AND MAINTENANCE 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.

**UNIT V PROJECT MANAGEMENT 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 :45 PERIODS****OUTCOMES:****On Completion 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.
- 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.

**TEXT BOOKS:**

1. Roger S. Pressman, "Software Engineering - A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.



## REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R. Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.
5. <http://nptel.ac.in/>.

19150L47

DATABASE MANAGEMENT SYSTEMS LABORATORY

L T P C

0 0 4 2

## AIM:

The aim of this laboratory is to inculcate the abilities of applying the principles of the database management systems. This course aims to prepare the students for projects where a proper implementation of databases will be required.

## OBJECTIVES:

- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

1. Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2. Database Querying - Simple queries, Nested queries, Sub queries and Joins
3. Views, Sequences, Synonyms
4. Database Programming: Implicit and Explicit Cursors
5. Procedures and Functions
6. Triggers
7. Exception Handling
8. Database Design using ER modeling, normalization and Implementation for any application
9. Database Connectivity with Front End Tools
10. Case Study using real life database applications

**TOTAL: 60 PERIODS**

## OUTCOMES:

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

- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Implement applications that require a Front-end Tool
- Critically analyze the use of Tables, Views, Functions and Procedures

**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 programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers 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 student 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 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 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 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 - Sub rings - Integral domain - Field - Integer modulo n - Ring homomorphism.

**UNIT II FINITE FIELDS AND POLYNOMIALS**

12

Rings - Polynomial rings - Irreducible polynomials over finite fields --Factorization of polynomials over finite fields.

**UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS**

12

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**

12

Linear Diophantine equations - Congruence's - Linear Congruence's--Applications: Divisibility tests Modular exponentiation-Chinese remainder theorem - 2 x 2 linear systems.

**UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS**

12

Wilson's theorem - Fermat's little theorem - Euler's theorem - Euler's Phi functions - Tau and Sigma functions.

**TOTAL: 60 PERIODS****OUTCOMES:**

**Upon successful completion of the course, 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.P and Ramana, B.V., "Discrete and Combinatorial Mathematics", Pearson Education, 5<sup>th</sup> 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, 2<sup>nd</sup> 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,

**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, ICMP v4 - 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:**

**On Completion 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 BOOK:**

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.

**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" 3<sup>rd</sup> edition, Tata McGrawHill, 2012

**19150C55****THEORY OF COMPUTATION****L T P C  
3 0 0 3****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 :45PERIODS****OUTCOMES:**

**Upon completion of the course, the students will 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 BOOK:**

1. J.E.Hopcroft, R.Motwani and J.D Ullman, "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.

19150C56

OBJECT ORIENTED ANALYSIS AND DESIGN

L T P C

3 0 0 3

## 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 sequence 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

Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams - When to use Component and Deployment 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 will 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

**TEXT BOOKS:**

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.

**19150L57      MICROPROCESSORS AND MICROCONTROLLERS LABORATORY****L T P C  
0 0 4 2****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. Key board 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 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

**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:****HARDWARE:**

8086 development kits - 30 nos  
Interfacing Units - Each 10 nos  
Microcontroller - 30 nos

**SOFTWARE:**

Intel Desktop Systems with MASM - 30 nos  
8086 Assembler  
8051 Cross Assembler

**19150L58****OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY****L T P C  
0 0 4 2****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.

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 usecase 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 reservation system

6. Airline/Railway reservation 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:**

**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.

**HARDWARE REQUIREMENTS**

Standard PC

**SOFTWARE REQUIREMENTS**

1. Windows 7 or higher
2. ArgoUML that supports UML 1.4 and higher
3. Selenium, JUnit or Apache JMeter

**19150L59**

**NETWORKS LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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 web page using TCP sockets.
3. Applications using TCP sockets like:
  - Echo client and echo server
  - Chat
  - File Transfer
4. Simulation of DNS using UDP sockets.
5. Write a code 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:**

**Upon Completion of the course, the students will 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.

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:**

**HARDWARE:**

1. Standalone desktops 30 Nos

**SOFTWARE:**

1. C / C++ / Java / Python / Equivalent Compiler 30
2. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

**19150C61**

**INTERNET PROGRAMMING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**OBJECTIVES:**

- To understand different Internet Technologies.
- To learn java-specific web services architecture

**UNIT I WEBSITE BASICS, HTML 5, CSS 3, 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 WEB SERVICES 9**

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back 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 dynamic web page with validation using Java Script 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

**TEXT BOOK:**

1. Deitel and Deitel and Nieto, "Internet and World Wide Web - How to Program", Prentice Hall, 5th Edition, 2011.

**REFERENCES:**

1. Stephen Wynkoop and John Burke "Running a Perfect Website", 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", Pearson Education, 2011.
4. Gopalan N.P. and Akilandeswari J., "Web Technology", Prentice Hall of India, 2011.
5. UttamK.Roy, "Web Technologies", Oxford University Press, 2011.

**19150C62**

**ARTIFICIAL INTELLIGENCE**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 9**

AI applications - Language Models - Information Retrieval- Information Extraction - Natural Language Processing - Machine Translation - Speech Recognition - Robot - Hardware - Perception - Planning - Moving

**TOTAL :45 PERIODS**

**OUTCOMES:**

**Upon completion of the course, the students will 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.

**TEXT BOOKS:**

- 1 S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
- 2 I. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

**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", Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

19150C63

**MOBILE COMPUTING**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
Introduction to Mobile Computing - Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing - Spread spectrum -MAC Protocols - SDMA- TDMA- FDMA- CDMA		
<b>UNIT II</b>	<b>MOBILE TELECOMMUNICATION SYSTEM</b>	<b>9</b>
Introduction to Cellular Systems - GSM - Services & Architecture - Protocols - Connection Establishment - Frequency Allocation - Routing - Mobility Management - Security - GPRS- UMTS - Architecture - Handover - Security		
<b>UNIT III</b>	<b>MOBILE NETWORK LAYER</b>	<b>9</b>
Mobile IP - DHCP - AdHoc- Proactive protocol-DSDV, Reactive Routing Protocols - DSR, AODV , Hybrid routing -ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks ( VANET) -MANET Vs VANET - Security.		
<b>UNIT IV</b>	<b>MOBILE TRANSPORT AND APPLICATION LAYER</b>	<b>9</b>
Mobile TCP- WAP - Architecture - WDP - WTLS - WTP -WSP - WAE - WTA Architecture - WML		
<b>UNIT V</b>	<b>MOBILE PLATFORMS AND APPLICATIONS</b>	<b>9</b>
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

**TEXT BOOKS:**

1. Jochen Schiller, "Mobile Communications", PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi - 2012

**REFERENCES**

1. Dharma Prakash Agarwal, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. William.C.Y.Lee, "Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition, TataMcGraw Hill Edition ,2006.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
5. Android Developers : <http://developer.android.com/index.html> 6.
- Apple Developer : <https://developer.apple.com/>
7. Windows Phone DevCenter : <http://developer.windowsphone.com> 8.
- BlackBerry Developer : <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 12**

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 8**

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 8**

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.

**UNIT V CODE OPTIMIZATION 8**

Principal Sources of Optimization - Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

**LIST OF EXPERIMENTS:**

1. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.). Create a symbol table, while recognizing identifiers.
2. Implement a Lexical Analyzer using Lex Tool
3. Implement an Arithmetic Calculator using LEX and YACC
4. Generate three address code for a simple program using LEX and YACC.
5. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
6. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

<b>PRACTICALS</b>	<b>30</b>	<b>PERIODS</b>
<b>THEORY</b>	<b>45</b>	<b>PERIODS</b>
<b>TOTAL :</b>	<b>75</b>	<b>PERIODS</b>

**OUTCOMES:**

**On Completion 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.



## TEXT BOOK:

1. 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.

19150C65

DISTRIBUTED SYSTEMS

L T P C  
3 0 0 3

## 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

## UNIT III DISTRIBUTED MUTEX & DEADLOCK

9

**Distributed mutual exclusion algorithms:** Introduction - Preliminaries - Lamport's algorithm - Ricart-Agrawala 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.

**UNIT IV RECOVERY & CONSENSUS 9**  
**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 this course, the students will be able to:**

- Elucidate the foundations and issues of distributed systems
- Understand the various synchronization issues and global state for distributed systems.
- 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

**TEXT BOOKS:**

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 Niranjan 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.

<b>17150L67</b>	<b>INTERNET PROGRAMMING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**OBJECTIVES:**

- To be familiar with Web page design using HTML/XML and style sheets
- 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 hot spots in that map
  - c. Show all the related information when the hot spots are clicked.

2. Create a web page with the following.
  - a. Cascading style sheets.
  - b. Embedded style sheets.
  - c. Inline style sheets. 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 mark list. Assume that student information is available in a database which has been stored in a database server.
6. Install TOMCAT web server. 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 catalogue should be dynamically loaded from the database.
8. Create and save an XML document at the server, which contains 10 users Information. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document
9.
  - i. Validate the form using PHP regular expression.
  - ii. PHP stores a form data into database.
10. Write a web service for finding what people think by asking 500 people's opinion for any consumer product.

**TOTAL: 60PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Construct Web pages using HTML/XML and style sheets.
- Build dynamic web pages with validation using Java Script 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.

**SOFTWARE REQUIRED:**

- Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

**17150L68**

**MOBILE APPLICATION DEVELOPMENT LABORATORY**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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 a native 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:

**Upon Completion of the course, the students will 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.

## REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

**LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS: SOFTWARE:** C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent **HARDWARE:** Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

**17150L6PC**

**PROFESSIONAL COMMUNICATION**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

## 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.

**19150C71 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.

**TOTAL: 45 PERIODS**

**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

**TEXTBOOKS:**

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 10<sup>th</sup> Edition, 2009.
2. JAF 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 PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999

**19150C72**

**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.**

<b>UNIT II</b>	<b>SYMMETRIC KEY CRYPTOGRAPHY</b>	<b>9</b>
MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures--Modular arithmetic-Euclid's algorithm- Congruence and matrices -Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: SDES - 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.		
<b>UNIT III</b>	<b>PUBLIC KEY CRYPTOGRAPHY</b>	<b>9</b>
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.		
<b>UNIT IV</b>	<b>MESSAGE AUTHENTICATION AND INTEGRITY</b>	<b>9</b>
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		
<b>UNIT V</b>	<b>SECURITY PRACTICE AND SYSTEM SECURITY</b>	<b>9</b>
Electronic Mail security - PGP, S/MIME - IP security - Web Security - SYSTEM SECURITY: Intruders - Malicious software - viruses - Firewalls.		
		<b>TOTAL 45 PERIODS</b>

**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. BehrouzA.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

**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.

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>9</b>
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.		
<b>UNIT II</b>	<b>CLOUD ENABLING TECHNOLOGIES</b>	<b>10</b>
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.		
<b>UNIT III</b>	<b>CLOUD ARCHITECTURE, SERVICES AND STORAGE</b>	<b>8</b>
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.		
<b>UNIT IV</b>	<b>RESOURCE MANAGEMENT AND SECURITY IN CLOUD</b>	<b>10</b>
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.		
<b>UNIT V</b>	<b>CLOUD TECHNOLOGIES AND ADVANCEMENTS</b>	<b>8</b>
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:**

**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.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

**TEXT BOOKS:**

1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. 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.



**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
1. Install Virtualbox/VMware Workstation with different flavours of linux or windows OS on top of windows7 or 8.
  2. Install a C compiler in the virtual machine created using virtual box and execute Simple Programs
  3. Install Google App Engine. Create *hello world* app and other 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:****On completion of this course, the students will be able to:**

- Configure various virtualization tools such as Virtual Box, VMware workstation.
- Design and deploy a web application in a PaaS environment.
- Learn how to simulate a cloud environment to implement new schedulers.
- Install and use a generic cloud environment that can be used as a private cloud.
- Manipulate large data sets 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) Ceaser 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 eg. Snort or any other s/w.

10. Automated Attack and Penetration Tools  
Exploring N-Stalker, a Vulnerability Assessment Tool
11. Defeating Malware
  - i) Building Trojans ii) Rootkit Hunter

**TOTAL: 60 PERIODS**

**OUTCOMES:**

**Upon Completion of the course, the students will be able to:**

- Develop code for classical Encryption Techniques to solve the problems.
- Build cryptosystems 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

**REFERENCES:**

1. Build Your Own Security Lab, Michael Gregg, Wiley India

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: SOFTWARE:** C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent **HARDWARE:** Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more.

<b>19150E66A</b>	<b>DATA WAREHOUSING AND DATA MINING</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**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:

Upon completion 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

### TEXT BOOK:

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, 35<sup>th</sup> 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.

**19150E66B**

**SOFTWARE TESTING**

**L T P C**  
**3 0 0 3**

### 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 will be able to:**

- Design test cases suitable for a 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.

### TEXT BOOKS:

1. Srinivasan Desikan and Gopaldaswamy 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 understand the Software Project Planning and Evaluation techniques.
- To plan and manage projects at each stage of the software development life cycle (SDLC).
- To learn about the activity planning and risk management principles.
- To manage software projects and control software deliverables.
- To develop skills to manage the various phases involved in project management and people management.
- To deliver successful software projects that support organization's strategic goals.

**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 LIFE CYCLE 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

**TEXT BOOK:**

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.

<b>19150E75E</b>	<b>INTERNET OF THINGS</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

#### 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 - No SQL 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 Plantwide Ethernet Model (CPwE) - Power Utility Industry - GridBlocks Reference Models Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

**TOTAL : 45 PERIODS**

#### OUTCOMES:

**Upon completion of the course, the student should be able to:**

- Explain the concept of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Rasperry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

#### TEXTBOOK:

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 Madiseti, "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, 2<sup>nd</sup> Edition, O'Reilly Media, 2011.  
<https://www.arduino.cc/>  
[https://www.ibm.com/smarterplanet/us/en/?ca=v\\_smarterplanet](https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet)

**19150E76C**

**C# AND .NET PROGRAMMING**

**L T P C**  
**3 0 0 3**

## 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 C# ADVANCED FEATURES 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 BASE CLASS LIBRARIES AND DATA MANIPULATION 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 WINDOW BASED APPLICATIONS, WCF AND WWF 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 .NET FRAMEWORK AND COMPACT FRAMEWORK 9**

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - Appdomains  
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:**

**Upon completion of the course, the students will 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.

**TEXT BOOKS:**

1. Christian Nagel, Bill Evjen, 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.

**REFERENCES**

1. Ian Gariffiths, Mathew Adams, Jesse Liberty, Programming C# 4.0, O\_Reilly, Fourth Edition, 2010.
2. Andrew Troelsen, Pro C# 5.0 and the .NET 4.5 Framework, Apress publication, 2012.
3. Andy Wigley, Daniel Moth, Peter Foot, Mobile Development Handbook, Microsoft Press, 2011.

<b>19150E76E</b>	<b>ADVANCED TOPICS ON DATABASES</b>	<b>L T P C</b>
		<b>3 0 0 3</b>

**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 - OQL - 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- TSQL2- 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:

Upon Completion of the course, the students will be able,

- To develop in-depth understanding of relational databases and skills to optimize database performance in practice.
- To understand and critique on each type of databases.
- To design faster algorithms in solving practical database problems.
- To implement intelligent databases and various data models.

#### TEXT BOOKS:

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.

19150E76H

**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 Process 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 Vulnerable 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.

**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, NSTISSC 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/BS 7799, 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 this 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.

**TEXT BOOK:**

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.

19150E81D

**SOFTWARE DEFINED NETWORKS**

L T P C  
3 0 0 3

**OBJECTIVES:**

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN

**UNIT I INTRODUCTION 9**

History of Software Defined Networking (SDN) - Modern Data Center - Traditional Switch Architecture - Why SDN - Evolution of SDN - How SDN Works - Centralized and Distributed Control and Date Planes

**UNIT II OPEN FLOW & SDN CONTROLLERS 9**

Open Flow Specification - Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays - SDN via Opening up the Device - SDN Controllers - General Concepts

**UNIT III DATA CENTERS 9**

Multitenant and Virtualized Multitenant Data Center - SDN Solutions for the Data Center Network - VLANs - EVPN - VxLAN - NVGRE

**UNIT IV SDN PROGRAMMING 9**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs - Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

**UNIT V SDN 9**

Juniper SDN Framework - IETF SDN Framework - Open Daylight Controller - Floodlight Controller - Bandwidth Calendaring - Data Center Orchestration

**TOTAL :45 PERIODS**

**OUTCOMES:**

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

- Analyze the evolution of software defined networks
- Express the various components of SDN and their uses
- Explain the use of SDN in the current networking scenario
- Design and develop various applications of SDN

**TEXT BOOKS:**

1. Paul Goransson and Chuck Black, Software Defined Networks: A Comprehensive Approach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, SDN: Software Defined Networks, O'Reilly Media, 2013.

**REFERENCES:**

1. Siamak Azodolmolky, Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, SDN and Open Flow for Beginners, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

**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

## 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

19150E82A

INFORMATION RETRIEVAL TECHNIQUES

L T

P C

3 0 0 3

## 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:**

**Upon completion of the course, the students will 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.

#### **TEXT BOOKS:**

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", 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.

**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMIL NADU

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

DEPARTMENT OF  
COMPUTER SCIENCE & ENGINEERING

**PROGRAM HANDBOOK**

**B.TECH CSE(PART-TIME)**

[REGULATION 2019]

[for candidates admitted to B.Tech CSE program from June 2019 onwards]



## 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 team 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 behaviors that students acquire during the time of graduation through the program objectives. Students should be in possession of:

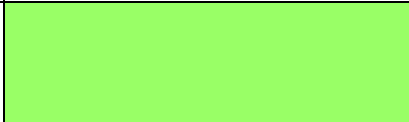
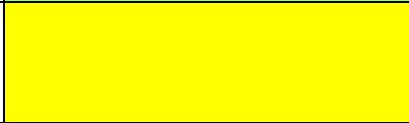

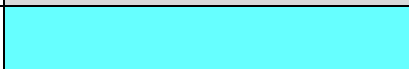
- a) An ability to apply mathematical, algorithmic principles, and computing techniques in the modeling and design of computer-based systems.
- b) An ability to apply software engineering techniques to design, implement and test a software system, and to evaluate and compare the efficiencies of alternative 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 multi disciplinary 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, communication 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.

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					

**MAPPING OF PEO WITH PO**

# COURSE STRUCTURE

# LEGEND

1.1.3	COLOUR
SKILL DEVELOPMENT	
EMPLOYABILITY	
EMPLOYABILITY / SKILL DEVELOPMENT	
ENTREPRENEURSHIP	

## B.TECH CSE (PT) R-19

### SEMESTER I

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19148S11P	Transforms and Partial Differential Equations	3	1	0	4
19150C12P	Digital Systems	3	0	0	3
19150C13P	Data Structures and algorithms	3	1	0	4
19150C14P	Computer Architecture and Organization	3	1	0	4
19150C15P	Object Oriented Programming	3	1	0	4
Total No. of credits					19

### SEMESTER II

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19148S21P	Numerical Methods	3	1	0	4
19150C22P	Microprocessors and Interfacing	3	0	0	3
19150C23P	Database Management Systems	3	1	0	4
19150C24P	Design and Analysis Of Algorithm	3	1	0	4
19150C25P	Software Engineering	3	1	0	4
Total No. of credits					19

### SEMESTER III

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19148S31P	Discrete Mathematics	3	1	0	4
19150C32P	Operating System	4	0	0	4
19150C33P	Artificial Intelligence	4	0	0	4
19150C34P	Computer Networks	4	0	0	4
19150L35P	Operating Systems and Networking Lab	0	0	3	2
Total No. of credits					18

### SEMESTER IV

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150C41P	Principles Of Cryptography	3	1	0	4
19150C42P	Web Technology	3	1	0	4
19150C43P	C# And .Net Framework	3	1	0	4
19150E44_P	Elective-I	3	1	0	4
19150L45P	Internet Programming Lab	0	0	3	2
<b>Total No. of credits</b>					<b>18</b>

### SEMESTER – V

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150C51P	Object Oriented Analysis and Design	4	0	0	4
19150C52P	Software Quality Management	3	1	0	4
19150C53P	Graphics and Multimedia	3	1	0	4
19150E54_P	Elective -II	3	1	0	4
19150L55P	Software Development Lab	0	0	3	2
<b>Total No. of credits</b>					<b>18</b>

### SEMESTER – VI

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150C61P	Embedded Systems	4	0	0	4
19150C62P	Advanced Java programming	3	1	0	4
19150C63P	Software Testing	4	0	0	4
19150E64_P	Elective III	4	0	0	4
19150L65P	Java Programming Lab	0	0	3	2
<b>Total No. of credits</b>					<b>18</b>

### SEMESTER – VII

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19160S71P	Total Quality Management	3	0	0	3
19150C72P	Grid Computing	4	0	0	4
19150C73P	Middleware Technologies	3	1	0	4
19150E74_P	Elective IV	3	0	0	3
19150P75P	Project	0	0	12	6
<b>Total No. of credits</b>					<b>20</b>

**LIST OF ELECTIVES**  
**SEMESTER – IV (ELECTIVE I)**

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150E44AP	Theory of Computation	3	1	0	4
19150E44BP	Real Time Systems	3	1	0	4
19150E44CP	User Interface Design	3	1	0	4
19150E44DP	Advanced Databases	3	1	0	4

**SEMESTER - V(ELECTIVE II)**

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150E54AP	Soft Computing	3	1	0	4
19150E54BP	Principles of Compiler Design	3	1	0	4
19150E54CP	Distributed Systems	3	1	0	4
19150E54DP	Mobile Computing	3	1	0	4

**SEMESTER – VI(ELECTIVE III)**

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150E64AP	Principles of Management	4	0	0	4
19150E64BP	Unix Internals	4	0	0	4
19150E64CP	Parallel Computing	4	0	0	4
19150E64DP	Programming paradigms	4	0	0	4

**SEMESTER – VII (ELECTIVE VI)**

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
19150E74AP	High Speed Networks	3	0	0	3
19150E74BP	Bio Informatics	3	0	0	3
19150E74CP	Software Project Management	3	0	0	3
19150E74DP	Digital Image Processing	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
<b>Total Credits</b>								<b>130</b>

<b>TOTAL CREDITS</b>	
Semester - I	19
Semester - II	19
Semester - III	18
Semester - IV	18
Semester - V	18
Semester - VI	18
Semester - VI	20
<b>TOTAL CREDITS</b>	<b>130</b>



# 19148S11P - 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 eigenfunctions 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 transforms 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 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: 60hrs**

## 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.

**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



**TEXT BOOKS:**

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, 2<sup>nd</sup> 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

# 19150H13P- 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 PROBLEM SOLVING

9+3

Problem solving- 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 - Heap sort - Merge sort - Quick sort - Bubble sort

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: 60 hrs**

## TEXT BOOKS:

R.G.Dromey, "How to solve it by computer", Prentice- Hall of India, 2002.

1. Aaron M. Tenenbaum, Yeedidiah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2<sup>nd</sup> 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.

## 19150H14P- COMPUTERARCHITECTURE AND ORGANIZATION

### AIM

To understand the basic structure and organization of digital computer.

### OBJECTIVES:

- 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.
- To have a thorough understanding of

### 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**

### TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5<sup>th</sup> Edition “Computer Organization”, McGraw-Hill, 2002.
2. Organization and Design: The hardware / software interface”, 2<sup>nd</sup> Edition, Morgan Kaufmann, 2002.
3. John P.Hayes, “Computer Architecture and Organization”, 3<sup>rd</sup> Edition, McGraw Hill, 1998.

**REFERENCES:**

1. William Stallings, “Computer Organization and Architecture - Designing for Performance”, 6<sup>th</sup> Edition, Pearson Education, 2003.

David A. Patterson and John L.Hennessy, “Computer

## 19150H15P - OBJECT ORIENTED PROGRAMMING

To introduce the students about object oriented programming and design.

### OBJECTIVES:

On completion of the class, a student should be able:

- to prepare object-oriented design for small/medium scale problems
- to demonstrate the differences between traditional imperative design and object-oriented design
- to explain class structures as fundamental, modular building blocks
- to understand the role of inheritance, polymorphism, dynamic binding and generic

structures in building reusable code

- to write small/medium scale C++ programs with simple graphical user interface
- to use classes written by other programmers when constructing their systems
- to understand and to use fundamental data structures: collections, sets, dictionaries,

lists, stacks, queues, trees, graphs.

UNIT-I

9

Introduction to OOP: Overview of C++ - classes - structures - union - friend function - friend class - inline function - constructors - static members - scope resolution operator - passing objects to functions - function returning objects

UNIT-II

9

Arrays - pointers - this pointer - references - dynamic memory allocation - functions overloading - default arguments - overloading constructors - pointers to functions

UNIT-III

9

Operator overloading - member operator function - friend operator function - type conversion - inheritance - types of inheritance - virtual base class - polymorphism - virtual function.

UNIT-IV

9

Class templates and generic classes - function templates and generic functions - overloading a function templates - power of templates - exception handling - derived class exception - exception handling functions

UNIT-V

9

Streams - formatted I/O with its class functions and manipulators - creating own manipulators - file I/O - conversion functions - standard template library.

Total Hours : 45

### **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 A K, Rath A M, and Dehuri S, "Object Oriented Programming Using C++", PHI, 2007.



## 19148S21P-NUMERICAL METHODS

### 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-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: 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:**

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.

# MICROPROCESSOR AND MICROCONTROLLER

## 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 8279Interrupt 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 : 60 Hrs.**

## TEXT BOOKS:

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4<sup>th</sup> 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)

5. A.K. Ray and K.M. Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGrawHill International Edition, 2000 (Unit III, IV).
6. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2<sup>nd</sup> Edition, Penram International Publishers (India), New Delhi, 1996.
7. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

# 19150H24P- DESIGN AND ANALYSIS OF ALGORITHMS

## AIM

This course aims to introduce the classic and complex algorithms in various domains, and techniques for designing and analyzing the efficient algorithms.

## OBJECTIVES:

- To prove the correctness and analyze the running time of the basic algorithms
- To apply the algorithms and design techniques to solve problems.
- To analyze the complexities of various problems in different domains.

## UNIT I BASIC CONCEPTS OF ALGORITHMS 8 + 3

Introduction - Notion of Algorithm - Fundamentals of Algorithmic Solving - Important Problem types - Fundamentals of the Analysis Framework - Asymptotic Notations and Basic Efficiency Classes.

## UNIT II 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.

## UNIT III 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.

## UNIT IV 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.

## UNIT V 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.**

## TEXT BOOKS:

1. Anany Levitin, "Introduction to the Design and Analysis of Algorithm", 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.

# 19150H25P- SOFTWARE ENGINEERING

## AIM

To make the students understand the methodologies in preparing a software.

## **OBJECTIVES:**

- To know the generic models to structure the software development process.
- To understand different notion of complexity at both the module and system level.
- To be aware of some widely known design methods.
- To understand the role and contents of testing activities in different life cycle phases.

## UNIT I SOFTWARE PROCESS 9

Introduction -S/W Engineering Paradigm - life cycle models (water fall, incremental, spiral, WINWIN spiral, evolutionary, prototyping, object oriented)-- system engineering - computer based system - verification - validation - life cycle process - development process -system engineering hierarchy.

## UNIT II SOFTWARE REQUIREMENTS 9

Functional and non-functional - user - system -requirement engineering process - feasibility studies - requirements - elicitation - validation and management - software prototyping - prototyping in the software process - rapid prototyping techniques - user interface prototyping S/W document. Analysis and modeling - data, functional and behavioral models - structured analysis and data dictionary.

## UNIT III DESIGN CONCEPTS AND PRINCIPLES 9

Design process and concepts - modular design - design heuristic - design model and document. Architectural design - software architecture - data design - architectural design - transform and transaction mapping - user interface design - user interface design principles. Real time systems Real time software design - system design - real time executives - data acquisition system monitoring and control system. SCM - Need for SCM - Version control - Introduction to SCM process - Software configuration items.

## UNIT IV TESTING 9

Taxonomy of software testing - levels - test activities - types of s/w test - black box testing - testing boundary 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 unit testing - integration testing - validation testing - system testing and debugging.

## UNIT V SOFTWARE PROJECT MANAGEMENT 9

Measures and measurements - S/W complexity and science measure - size measure - data and logic structure measure - information flow measure. Software cost estimation - function point models - COCOMO model- Delphi method.- 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**

## **TEXT BOOK:**

1. Roger S.Pressman, Software engineering- A practitioner's Approach, McGraw-Hill International Edition, 5<sup>th</sup> edition, 2001.

## **REFERENCES:**

1. Ian Sommerville, Software engineering, Pearson education Asia, 6<sup>th</sup> 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 Behforooz and Frederick J Hudson, "Software Engineering Fundamentals", Oxford University Press, New Delhi, 1996.

# 19148S31P- 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.

## **UNIT II                      PREDICATE CALCULUS                      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.

## **UNIT III                      SET THEORY                      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.

## **UNIT IV                      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.

## **UNIT V                      GROUPS                      9 + 3hrs**

Algebraic systems - Definitions - Examples - Properties - Semigroups - Monoids - Homomorphism - Subsemigroups and Submonoids - Cosets and Lagrange's theorem - Codes and group codes - Basic notions of error correction - Error recovery in group codes.



**TEXT BOOKS:**

1. Trembly J.P and Manohar R, "Discrete Mathematical Structures with Applications 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.

**CSE/Sem III**

## **19150H32P- OPERATING SYSTEM**

### **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**

**TEXT BOOK:**

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, 4<sup>th</sup> Edition, 2003.
4. Pramod Chandra P. Bhatt - "An Introduction to Operating Systems, Concepts and Practice", PHI, 2003.

**CSE/Sem III**

**19150H33P- ARTIFICIAL INTELLIGENCE**

**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 problem 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**

## **TEXT BOOK:**

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”, 2<sup>nd</sup> Edition, Tata McGraw-Hill, 2003.



## 19150H34P - 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 standards 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 - low Control and Error control - stop and wait - go back-N ARQ - selective repeat ARQ- sliding window - HDLC. - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 - FDDI - SONET - Bridges.

**UNIT III NETWORK LAYER****9**

Internetworks - 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****TEXT BOOK:**

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**

**19150H41P- PRINCIPLES OF CRYPTOGRAPHY**

**AIM:**

To understand the principles of encryption algorithms, conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

**OBJECTIVES:**

- To be familiar with the methods of conventional encryption.
- To recognize the concepts of public key encryption and number theory
- To understand authentication and Hash functions.
- To know the network security tools and applications.

**UNIT I INTRODUCTION**

**10+3**

OSI Security Architecture - Classical Encryption techniques - Cipher Principles - Data Encryption Standard - Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES - AES Cipher - Triple DES.

**UNIT II PUBLIC KEY CRYPTOGRAPHY**

**10+3**

Key Management - Diffie-Hellman key Exchange - Introduction to Number Theory - Confidentiality using Symmetric Encryption - Public Key Cryptography and RSA.

**UNIT III AUTHENTICATION AND HASH FUNCTION**

**9+3**

Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions - Security of Hash Functions and MACs - MD5 message Digest algorithm - Secure Hash Algorithm- HMAC Digital Signatures - Authentication Protocols - Digital Signature Standard

**UNIT IV NETWORK SECURITY**

**8+3**

Authentication Applications: Kerberos - X.509 Authentication Service - Electronic Mail Security - PGP - S/MIME - IP Security - Web Security.

**UNIT V SYSTEM LEVEL SECURITY**

**8+3**

Intrusion detection - password management - Viruses and related Threats - Virus Counter measures - Firewall Design Principles - Trusted Systems.

**TOTAL : 60 hrs**



**TEXT BOOK:**

1. William Stallings, "Cryptography And Network Security - Principles and Practices", Prentice Hall of India, Third Edition, 2003.

**REFERENCES:**

1. Atul Kahate, "Cryptography and Network Security", Tata McGraw-Hill, 2003.
2. Bruce Schneier, "Applied Cryptography", John Wiley & Sons Inc, 2001.
3. Charles B. Pfleeger, Shari Lawrence Pfleeger, "Security in Computing", Third Edition, Pearson Education, 2003.

**SE/Sem IV**

**19150H42P- WEB TECHNOLOGY**

**AIM:**

To highlight the features of different technologies involved in Web Technology and various Scripting Languages.

**OBJECTIVES:**

- Students will get an introduction about various Scripting Languages.
- Students will be provided with an up-to-date survey of developments in Web Technologies.
- To gain knowledge about the socket programming , RMI and Dynamic web page development.
- Enable the students to know techniques involved to support real-time application development.

**UNIT I**

**9+3**

Internet principles - Basic Web concepts - Client -Server model - Retriving data from Internet - HTML and Scripting Languages - Protocols and applications.

**UNIT II**

**9+3**

HTML forms - CGI concepts - HTML tags emulation - Server browser communication - E-mail generation - CGI client side Applets - CGI Server side Applets - Authorization and Security.

**UNIT III**

**9+3**

Streaming - Networking Principles - Sockets for Clients - Sockets for Servers - Protocols handlers - Content handlers - Multicast sockets - Remote method invocation.

**UNIT IV**

**9+3**

Server-Dynamic Web content - Cascading Style Sheets, DHTML, XML - Applet-Servlets communication - Interactive Java Servlets - Active and Java Server Pages.

**UNIT V**

**9+3**

Simple applications - On-line Databases - Monitoring user events - Plugins - Database Connectivity.

**TOTAL : 60hrs**

**TEXT BOOK:**

1. Eillotte Rusty Harold, "Java Network Programming", O'Reilly Publications, 1997.

## **REFERENCES:**

1. Jason Hunter, William Crawford, "Java Servlets Programming", O'Reilly Publications, 1998.
2. Jeff Frantzen and Sobotka, "Java Script", Tata Mc Graw Hill, 1999.
3. Eric Ladd, Jim O'Donnell, "Using HTML 4, XML and JAVA", Prentice Hall Of India – QUE, 1999.

## 19150H43P-C # AND . NET FRAMEWORK

### 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 frame work.

### 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 MetaData, 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 SingleCall, Threads.

**TOTAL : 60hrs**

### TEXT BOOKS:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2<sup>nd</sup> 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#", 2<sup>nd</sup> 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.

**CSE/Sem IV**

## 19150H51P- OBJECT ORIENTED ANALYSIS AND DESIGN

### 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 OBJECT ORIENTED METHODOLOGIES**

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 OBJECT ORIENTED ANALYSIS**

9

Identifying use cases - Object Analysis - Classification - Identifying Object relationships Attributes and Methods.

**UNIT IV OBJECT ORIENTED DESIGN**

8

Design axioms - Designing Classes - Access Layer - Object Storage Object Interoperability.

**UNIT V SOFTWARE QUALITY AND USABILITY**

8

Designing Interface Objects - Software Quality Assurance - System Usability Measuring User Satisfaction

**TOTAL : 45hrs**

**TEXT BOOKS:**

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, Brain Lyons, David Fado, "UML Toolkit", OMG Press Wiley Publishing Inc., 2004.

**19150H52P- 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 models 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 : 60 hrs****TEXT BOOKS:**

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. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", Pearson Education, 2003. (UNIT 1 : Chapters 1 to 6; UNIT 2: Chapter 9 - 12, 15, 16)
2. Prabat K Andleigh and Kiran Thakrar, "Multimedia Systems and Design", PHI, 2003. (UNIT 3 to 5)

### **REFERENCES:**

1. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.

**CSE/Sem VI**

## **19150S61P- EMBEDDED SYSTEMS**

### **AIM:**

To teach students all aspects of the design and development of an embedded system, including hardware and embedded software development.

### **OBJECTIVES:**

- To Understand and design embedded systems.
- Understand the basics of an embedded system.
- Program an embedded system.
- Design, implement and test an embedded system.

### **UNIT I EMBEDDED COMPUTING 9**

**Challenges of Embedded Systems** - Embedded system design process. Embedded processors - 8051 Microcontroller, ARM processor - Architecture, Instruction sets and programming.

### **UNIT II MEMORY AND INPUT / OUTPUT MANAGEMENT 9**

**Programming Input and Output** - Memory system mechanisms - Memory and I/O devices and interfacing - Interrupts handling.

### **UNIT III PROCESSES AND OPERATING SYSTEMS 9**

Multiple tasks and processes - Context **switching** - **Scheduling policies** - Interprocess communication mechanisms - Performance issues.

### **UNIT IV EMBEDDED SOFTWARE 9**

**Programming** embedded systems in assembly and C - Meeting real time constraints - Multi-state systems and function sequences. Embedded software development tools - Emulators and debuggers.

### **UNIT V EMBEDDED SYSTEM DEVELOPMENT 9**

**Design issues and techniques** - Case studies - Complete design of example embedded systems.

**TOTAL = 45 hrs**

### **TEXT BOOKS:**

1. Wayne Wolf, "Computers as Components: Principles of Embedded Computer System Design", Elsevier, 2006.





**TEXT BOOKS:**

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, "CORE JAVA 2 ADVANCED FEATURES, VOL II", Pearson Education, 2002. (UNIT I and UNIT IV)

**REFERENCES:**

1. Web reference: <http://java.sun.com>.
2. Patrick Naughton, "COMPLETE REFERENCE: JAVA2", Tata McGraw-Hill, 2003.

## 19150H63P- SOFTWARE TESTING

### AIM:

It explains how to review, test and manage test requirements and how to incorporate testing into the software development life cycle.

### OBJECTIVES:

- To determine software testing objectives and criteria.
- To develop and validate a test plan.
- To select and prepare test cases.
- To identify the need for testing.
- To prepare testing policies and standards.
- To use testing aids and tools.
- To test before buying a software package and Test after maintenance and enhancement changes.
- To measure the success of testing efforts.

### UNIT I INTRODUCTION

9

Testing as an Engineering Activity - Role of Process in Software Quality - Testing as a Process - Basic Definitions - Software Testing Principles - The Tester's Role in a Software Development Organization - Origins of Defects - Defect Classes - The Defect Repository and Test Design - Defect Examples - Developer/Tester Support for Developing a Defect Repository.

### UNIT II TEST CASE DESIGN

9

Introduction to Testing Design Strategies - The Smarter Tester - Test Case Design Strategies - Using Black Box Approach to Test Case Design Random Testing - Requirements based testing - positive and negative testing - Boundary Value Analysis - decision tables - Equivalence Class Partitioning state-based testing - cause-effect graphing - error guessing - compatibility testing - user documentation testing - domain 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 - Their Role in White-box Based Test Design - code complexity testing - 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 - types of system testing - Acceptance testing - performance testing - Regression Testing - internationalization testing - ad-hoc testing - Alpha - Beta Tests - testing OO systems - usability and accessibility 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 - 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 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 - StatusMeetings - 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**

**TEXT BOOKS:**

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**

## 19150S71P-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.

### UNIT IV TQM TOOLS

9

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: 45hrs**

**TEXT BOOK:**

1. Besterfield et al D.H., “Total Quality Management”, Pearson Education, Inc.2003.

**REFERENCES:**

- 1.Evans, J. R. and Lidsay, 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”, Wood Head Publishers,1991.

## 19150H72P - GRID COMPUTING

### AIM:

To introduce the what's, why's and how's of Grid Computing; what is Grid Computing able to do for you today and what will it bring to you in time to come.

### OBJECTIVES:

- Understand and explain the basic concepts of Grid Computing;
- Explain the advantages of using Grid Computing within a given environment;
- Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup.

<b>UNIT I</b>	<b>GRID COMPUTING</b>	<b>9</b>
Introduction - Definition and Scope of grid computing		
<b>UNIT II</b>	<b>GRID COMPUTING INITIALIVES</b>	<b>9</b>
Grid Computing Organizations and their roles - Grid Computing analog - Grid Computing road map.		
<b>UNIT III</b>	<b>GRID COMPUTING APPLICATIONS</b>	<b>9</b>
Merging the Grid sources - Architecture with the Web Devices Architecture.		
<b>UNIT IV</b>	<b>TECHNOLOGIES</b>	<b>9</b>
OGSA - Sample use cases - OGSA platform components - OGSI - OGSA Basic Services.		
<b>UNIT V</b>	<b>GRID COMPUTING TOOL KITS</b>	<b>9</b>
Globus GT 3 Toolkit - Architecture, Programming model, High level services - OGSI .Net middleware Solutions.		
		<b>TOTAL : 45 hrs</b>

### TEXT BOOK:

1. Joshy Joseph & Craig Fellenstein, "Grid Computing", Pearson/PHI PTR-2003.

### REFERENCE:

1. Ahmar Abbas, "Grid Computing: A Practical Guide to technology and Applications", Charles River media - 2003.

## 19150H73P - MIDDLEWARE TECHNOLOGIES

### 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.

**UNIT V COM 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: 60 hrs**

**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.

**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/Sem IV/Electives**

**SEMESTER - IV (ELECTIVE I)**

**19150E44AP- THEORY OF COMPUTATION**

**AIM:**

To introduces basic computation models and the necessary mathematical techniques to express computer science problems as mathematical statements and to formulate proofs





**19150E44BP- REAL TIME SYSTEMS****AIM:**

To understand the implementation of real time systems

**OBJECTIVES:**

- To be familiar with Real-Time systems, Task scheduling, resource management, real-time operating systems and fault tolerant techniques.
- To study the priorities of transactions in real time databases.
- To understand how to achieve multitasking and concurrency in real time systems.

**UNIT I INTRODUCTION****9+3**

**Introduction - Issues in Real Time Computing**, Structure of a Real Time System. TaskClasses, Performance Measures for Real Time Systems, Estimating Program Runtimes. Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms, UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and FaultTolerant Scheduling.

**UNIT II PROGRAMMING LANGUAGES AND TOOLS****9+3**

Programming Language and Tools - Desired **Language characteristics, Data Typing, Control structures**, Facilitating Hierarchical Decomposition, Packages, Run-time(Exception) Error handling, Overloading and Generics, Multitasking, Low Levelprogramming, Task scheduling, Timing Specifications, Programming Environments, Run-time Support.

**UNIT III REAL TIME DATABASES****9+3**

Real time Databases - **Basic Definition, Real time Vs General** Purpose Databases, MainMemory Databases, Transaction priorities, Transaction Aborts, Concurrency ControlIssues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability, Maintaining Serialization Consistency, Databases for Hard Real Time systems.

**UNIT IV COMMUNICATION****9+3**

Real-Time Communication - Communications Media, **Network Topologies Protocols, Fault Tolerant Routing**. Fault Tolerance Techniques - Fault Types, Fault Detection. FaultError containment Redundancy, Data Diversity, Reversal Checks, Integrated Failurehandling.

**UNIT V EVALUATION TECHNIQUES****9+3**

Reliability Evaluation Techniques - **Obtaining Parameter Values, Reliability Models for Hardware Redundancy**, Software Error models. Clock Synchronization - Clock, A Nonfault-Tolerant Synchronization Algorithm, Impact of Faults, Fault Tolerant Synchronization in Hardware, Fault Tolerant Synchronization in Software

**TOTAL:60 hrs****TEXT BOOKS:**

1. C.M. Krishna, Kang G. Shin, "Real-Time Systems", McGraw-Hill International Editions, 1997.

**REFERENCES:**

1. Stuart Bennett, "Real Time Computer Control-An Introduction", Second edition Perntice Hall PTR, 1994.
2. Peter D. Lawrence, "Real time Micro Computer System Design - An Introduction", McGraw Hill, 1988.
3. S.T. Allworth and R.N. Zobel, "Introduction to real time software design", Macmillan, II Edition, 1987.
4. R.J.A Buhur, D.L. Bailey, " An Introduction to Real-Time Systems", Prentice-Hall International, 1999.

***CSE/Sem IV/Electives***

## **19150E44CP-USER INTERFACE DESIGN**

### **AIM:**

It focuses on the basic concepts of how human perceives and interacts with computers.

### **OBJECTIVES:**

- Able to critique problems that exist in current interactive software and websites.
- To learn several usability evaluation methods.

- To learn several characteristics of controls in windows.
- To understand how to exercise with multimedia tools.
- To learn different kinds of tests in windows.

### UNIT I INTRODUCTION 8+3

Human-Computer Interface - Characteristics Of Graphics Interface -Direct Manipulation Graphical System - Web User Interface -Popularity -Characteristic & Principles.

### UNIT II HUMAN COMPUTER INTERACTION 10+3

User Interface Design Process - Obstacles -Usability -Human Characteristics In Design- Human Interaction Speed -Business Functions -Requirement Analysis - Direct -Indirect Methods - Basic Business Functions - Design Standards - System Timings -Human Consideration In Screen Design - Structures Of Menu - Functions Of Menus-Contents Of Menu- Formatting - Phrasing The Menu - Selecting Menu Choice-Navigating Menus- Graphical Menus.

### UNIT III WINDOWS

9+3

Characteristics- Components- Presentation Styles- Types- Managements-Organizations- Operations- Web Systems- Device- Based Controls Characteristics-Screen - Based Controls - Operate Control - Text Boxes- Selection Control-Combination Control- Custom Control- Presentation Control.

### UNIT IV MULTIMEDIA 9+3

Text For Web Pages - Effective Feedback- Guidance & Assistance- Internationalization- Accessibility- Icons- Image- Multimedia - Coloring.

### UNIT V WINDOWS LAYOUT- TEST

9+3

Prototypes - Kinds Of Tests - Retest - Information Search - Visualization -Hypermedia - WWW- Software Tools.

**TOTAL: 60hrs**

### TEXT BOOKS:

1. Wilbent. O. Galitz ,“The Essential Guide To User Interface Design”, John Wiley& Sons, 2001.
2. Ben Sheiderman, “Design The User Interface”, Pearson Education, 1998.

### REFERENCES:

1. Alan Cooper, “The Essential Of User Interface Design”, Wiley - Dream Tech Ltd.,2002.

**CSE/Sem IV/Electives**

## 19150E44DP- ADVANCED DATABASES

### AIM:

To have strong knowledge on Database Management Systems, Database technologies , an application-oriented , system-oriented approach towards databasedesign.

### 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 : 60 hrs**

### **TEXT BOOK:**

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 Rob and Corlos Coronel, "Database Systems – Design, Implementation and Management", Thompson Learning, Course Technology, 5<sup>th</sup> Edition, 2003.

## SEMESTER - V(ELECTIVE II)

## 19150E54AP- SOFT COMPUTING

**AIM:**

To understand the overall knowledge of soft computing theories and fundamentals.

**OBJECTIVES:**

- To study the fundamentals of artificial neural networks, fuzzy sets and fuzzy logic and genetic algorithms.
- Fuzzy sets to solve hard real-world problems.
- To given an overview of Genetic algorithms and machine learning techniques to solving hard real-world problems.
- To study about the applications of these areas.

**UNIT I FUZZY SET THEORY****10+3**

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+3**

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 ARTIFICIAL INTELLIGENCE****10+3**

Introduction, Knowledge Representation - Reasoning, Issues and Acquisition: Propositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainty Basic knowledge Representation Issues Knowledge acquisition - Heuristic Search: Techniques for Heuristic search Heuristic Classification - State Space Search: Strategies Implementation of Graph Search Search based on Recursion Patent-directed Search Production System and Learning.

**UNIT IV NEURO FUZZY MODELING****9+3**

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 APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8+3**

Printed Character Recognition - Inverse Kinematics Problems - Automobile Fuel Efficiency Prediction - Soft Computing for Color Recipe Prediction.

**TOTAL: 60hrs****TEXT BOOKS:**

1. J.S.R. Jang, C.T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

2. N.P. Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

### **REFERENCES:**

1. Elaine Rich & Kevin Knight, "Artificial Intelligence", Second Edition, Tata Mcgraw Hill Publishing Comp., 2006, New Delhi.

2. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.

**CSE/Sem V/Electives**

## **19150E54BP- 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 RUN TIME 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.

**TEXT BOOK:**

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. Loudon, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

# 19150E54CP- DISTRIBUTED SYSTEMS

## AIM:

This course discuss 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 distributes 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 distributing 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 file system - Introduction to Name Services- Name services and DNS - Directory and directory services

## **UNIT III DISTRIBUTED OPERATING SYSTEM 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**

## **TEXT BOOK:**

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.

## 19150E54DP- 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 hand off.
- 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**

Telecommunication 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:60 hrs**

### **TEXT BOOKS:**

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. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
3. Hazysztof Wesolowski, "Mobile Communication Systems", John Wiley and Sons Ltd, 2002.

***CSE/Sem VI/Electives***

**SEMESTER - VI  
(ELECTIVE III)**

**19160E64AP- PRINCIPLES OF MANAGEMENT**

**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

- Direct and Preventive Control - Reporting - The Global Environment - Globalization and Liberalization - International Management and Global theory of Management.

**TOTAL:45 hrs**

**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.

**REFERENCES**

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 Gillbert Management, pearson Education, Sixth Edition, 2004.
4. Fraidoon Mazda, "Engineering Management", Addison Wesley, 2000.

## 19150E64BP- UNIX INTERNALS

**AIM:**

This course focus to bend 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-OperatingSystem Services-Assumptions About Hardware. Introduction to the Kernel-ArchitectureSystem Concepts-Data Structures-System Administration.

**UNIT II****9**

The Buffer Cache-Headers-Buffer Pool-Buffer Retrieval-Reading and Writing DiskBlocks-Advantages and Disadvantages. Internal Representation of Files-Inodes-Structure-Directories-Path Name to Inode- Super Block-Inode Assignment-Allocation ofDisk Blocks -Other File Types.

**UNIT III****9**

System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special filesCreation-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-Contextof a Process-Saving the Context-Manipulation of a Process Address Space-SleepProcess Control-signals-Process Termination-Awaiting-Invoking other Programs-TheShell-System Boot and the INIT Process.

**UNIT V****9**

Memory Management Policies-Swapping-Demand Paging-a Hybrid System-I/OSubsystem-Driver Interfaces-Disk Drivers-Terminal Drivers.

**TOTAL: 45 hrs****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. Beck et al, "Linux Kernel Programming", Pearson Education Asia, 2002

## 19150E64CP- PARALLEL COMPUTING

### AIM:

To study the scalability & clustering issues, understand the technologies used for parallel computation, study the different inter connection networks and the different software programming models.

### OBJECTIVES:

- To study the scalability and clustering issues and the technology necessary for them.
- To understand the technologies enabling parallel computing.
- To study the different types of interconnection networks and parallel programming models.
- To study the software support needed for shared memory programming.

### **UNIT I SCALABILITY AND CLUSTERING**

**9**

Evolution of Computer Architecture - Dimensions of Scalability - Parallel Computer Models - Basic Concepts Of Clustering - Scalable Design Principles - Parallel Programming Overview - Processes, Tasks and Threads - Parallelism Issues - Interaction / Communication Issues - Semantic Issues In Parallel Programs.

### **UNIT I IENABLING TECHNOLOGIES**

**9**

System Development Trends - Principles of Processor Design - Microprocessor Architecture Families - Hierarchical Memory Technology - Cache Coherence Protocols - Shared Memory Consistency - Distributed Cache Memory Architecture - Latency Tolerance Techniques - Multithreaded Latency Hiding.

### **UNIT III SYSTEM INTERCONNECTS**

**9**

Basics of Interconnection Networks - Network Topologies and Properties - Buses, Crossbar and Multistage Switches, Software Multithreading - Synchronization Mechanisms.

### **UNIT IV PARALLEL PROGRAMMING**

**9**

Paradigms And Programmability - Parallel Programming Models - Shared Memory Programming.

### **UNIT V MESSAGE PASSING PROGRAMMING**

**9**

Message Passing Paradigm - Message Passing Interface - Parallel Virtual Machine.

**TOTAL : 45hrs**

### TEXT BOOK:

1. Kai Hwang and Zhi.Wei Xu, "Scalable Parallel Computing", Tata McGraw-Hill, New Delhi,2003.

### REFERENCES:

1. David E. Culler & Jaswinder Pal Singh, "Parallel Computing Architecture: A Hardware/Software Approach", Morgan Kaufman Publishers, 1999.
2. Michael J. Quinn, "Parallel Programming in C with MPI & OpenMP", Tata McGraw-Hill, NewDelhi,2003.
3. Kai Hwang, "Advanced Computer Architecture" Tata McGraw-Hill, New Delhi, 2003.

**19150E64DP- 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

**UNIT IV GENERIC PROGRAMMING 9**

Motivation for generic programming - generic classes - **generic methods - generic code** and virtual machine - inheritance and generics - reflection and generics - exceptions - exception hierarchy - throwing and catching exceptions - Stack Trace Elements - assertions - logging

**UNIT V CONCURRENT PROGRAMMING 9**

Multi-threaded programming - **interrupting threads - thread states** - thread properties - thread

synchronization - thread-safe Collections - Executors - synchronizers - threads and event-driven programming.

]

**TOTAL:45hrs**

**TEXT BOOK:**

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I - Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.



## **REFERENCES:**

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2000.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.
3. John R. Levine, Linkers & Loaders - Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

**SEMESTER - VII (ELECTIVE VI)**  
**19150E73AP- HIGH SPEED NETWORKS**

**AIM:** This course provides introduction to emerging high speed network technologies and facilitates the students identify where the new technology can be used to enhance performance of business networks.

**OBJECTIVES:**

- Good understanding of packet-switched networking concepts and principles of operation.
- Good understanding of Internet protocols and architectures (e.g., IP protocol stack).
- Solid foundation in computer operating systems fundamentals.
- Ability to perform independent research, analyze findings in high speed networks.

**UNIT I HIGH SPEED NETWORKS 9**

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LAN's: Fast Ethernet, Gigabit Ethernet, 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 Frame work, 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**

**TEXT BOOK:**

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***

**19150E73BP- BIO INFORMATICS**

**AIM:**

To impart knowledge, on basic techniques of Bioinformatics.

**OBJECTIVE:**

- To learnt about Sequencing Alignment and Dynamic Programming.
- To gain knowledge about various secondary ,ternary structures .
- To have ability to design drugs.
- To understand Evolutionary Trees and Phylogeny.

**UNIT I**

**9**

Introduction to molecular biology - **the genetic material - gene** structure - proteinstructure - chemical bonds -

molecular biology tools - genomic information content.

## UNIT II

9

Data searches - simple alignments - **gaps - scoring matrices** - dynamic programming - global and local alignments - database searches - multiple sequence alignments - Patterns for substitutions - estimating substitution numbers - evolutionary rates - molecular clocks - evolution in organelles.

## UNIT III

9

Phylogenetics - history and advantages - **phylogenetic trees - distance** matrix methods - maximum likelihood approaches - multiple sequence alignments - Parsimony - ancestral sequences - strategies for faster searches - consensus trees - tree confidence - comparison of phylogenetic methods - molecular phylogenies.

## UNIT IV

9

Genomics - **prokaryotic genomes: prokaryotic** gene structure - GC content - gene density - eukaryotic genomes: gene structure - open reading frames - GC content - gene expression - transposition - repeated elements - gene density.

## UNIT V

9

Amino acids - **polypeptide composition - secondary structure** - tertiary and quaternary structure - algorithms for modeling protein folding - structure prediction - predicting RNA secondary structures - Proteomics - protein classification - experimental techniques - inhibitors and drug design - ligand screening - NMR structures - empirical methods and prediction techniques - post-translational modification prediction.

**TOTAL: 45 hrs**

### TEXT BOOK:

1. D. E. Krane and M. L. Raymer, "Fundamental concepts of Bioinformatics", Pearson Education, 2003.

### REFERENCES:

1. Arthur M. Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005.

2. T. K. Attwood, D. J. Parry-Smith, and S. Phukan, "Introduction to Bioinformatics", Pearson Education, 1999.

3. Vittal R. Srinivas, "Bioinformatics - A Modern Approach", Prentice-Hall of India Pvt. Ltd., 2005.

**Sem VII/Electives**

## **19150E73CP- SOFTWARE PROJECT MANAGEMENT**

### 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

## UNIT 1 SOFTWARE MANAGEMENT

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

## UNIT 2 SOFTWARE MANAGEMENT PROCESS FRAMEWORK

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 overthe Life Cycle - Test Artifacts - Management Artifacts - Engineering Artifacts - Pragmatic Artifacts. Model-BasedSoftware Architectures - Management Perspective - Technical Perspective. Workflows of the Process - Software ProcessWorkflows - Iteration Workflows - Checkpoints of the Process.

## UNIT 3 SOFTWARE MANAGEMENT DISCIPLINES

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-BusinessOrganizations - Project Organizations - Evolution of Organizations. Process Automation - Tools: Automation BuildingBlocks - Project Environment - Round-Trip Engineering - Change Management. Project Control and ProcessInstrumentation - Seven Core Metrics - Management Indicators - Quality Indicators - . Pragmatic Software Metrics -Metrics Automation.

## UNIT 4 PROJECT PROFILES

9

Continuous Integration - **Early Risk Resolution - Evolutionary Requirements** - Teamwork among Stakeholders - Top 10 Software Management Principles - Software Management Best Practices - Next-Generation Software Economics - Next-Generation Cost Models - Modern Software Economics - Modern Process Transitions.

## UNIT 5 PROJECT EXECUTION AND CLOSURE

9

Review Process - Planning - Overview **and Preparation - Group Review Meeting** - Rework and Follow-up -Guidelines for Reviews in Projects - Analysis and Control Guidelines - Case Studies. Project Monitoring and Control - ProjectTracking - Activities Tracking - Defect Tracking - Issues Tracking - Status Reports - Milestone Analysis. DefectAnalysis and Prevention - Process Monitoring and Audit. Project Closure - Analysis - Analysis Report.

**TOTAL**  
45hrs

### TEXT BOOKS:

1. Walker Royce, "Software Project Management: A Unified Framework", Pearson, 2000 2. Pankaj Jalote, "Software Project Management in Practice", Pearson, 2002.

### REFERENCES:

1. Joel Henry, "Software Project Management: A Real-World Guide to Success". Pearson, 2004. 2. Kathy Schwalbe, "Information Technology Project Management", Course Technology, 2005

## 19150E73DP-DIGITAL IMAGE PROCESSING

### **AIM:**

The purpose of this course is to introduce the basic concept and methodologies for digital image processing.

### **OBJECTIVES :**

- To understand the fundamentals of image processing.
- To learn about the various transforms used in image processing.
- To introduce for enhancing the quality of images
- To gain knowledge about the various techniques of image enhancement, reconstruction, compression and segmentation.

### **UNIT 1 DIGITAL IMAGE FUNDAMENTALS 9**

Introduction-Elements of Digital Image Processing system- Visual perception and properties of human eye-image representation-A simple image model-Some basic relationship between pixels-Image geometry.

### **UNIT 2 IMAGE TRANSFORMS 9**

Introduction to Fourier Transform and DFT - Properties of 2D Fourier Transform-FFT- Separable Image Transforms -Walsh - Hadamard - Discrete Cosine Transform, Haar, -KL transforms.

### **UNIT 3 IMAGE ENHANCEMENT 9**

Image Enhancement b-Histogram Modeling-equalization and modification. Image smoothing-Image Sharpening-Spatial Filtering-Homomorphic Filtering for image enhancement.

### **UNIT 4 IMAGE RESTORATION 9**

Model of Image Degradation/restoration process –Inverse filtering -Least mean square(wiener) filtering –Constrained least mean square restoration – Singular value decomposition-Recursive filtering.

### **UNIT 5 IMAGE COMPRESSION AND SEGMENTATION 9**

Fundamentals -Image compression models- Lossless compression: Variable length coding-LZW coding. Lossy Compression: Transform coding-Wavelet coding. Image Segmentation: Detection of discontinuities-Edge linking and boundary detection-thresholding-Region oriented segmentation and Texture.

**TOTAL 45 hrs**

### **TEXT BOOKS:**

1. Rafael C Gonzalez, Richard E Woods, "Digital Image Processing"- 2nd Edition, Pearson Education 2003.
2. A.K. Jain, "Fundamentals of Digital Image Processing". Pearson education.

### **REFERENCES :**

1. William K Pratt, "Digital Image Processing", John Willey (2001).
2. Millman Sonka, Vaclav hlavac, Roger Boyle, Broos/colic, "Image Processing Analysis and Machine Vision"  
– Thompson learning, 1999.
3. S. Chanda, Dutta Magumdar – "Digital Image Processing and Applications", Prentice Hall of India, 2000.



**PRISTUNIVERSITY  
VALLAM, THANJAVUR.**

**DEPARTMENT OF  
COMPUTER SCIENCE & ENGINEERING  
PROGRAM HANDBOOK**

**M.Tech  
COMPUTER SCIENCE AND ENGINEERING  
[PART TIME]**

**[REGULATION 2019]**  
[for candidates admitted to M.Tech CSE program from June 2019 onwards]





**DEAN  
ENGINEERING AND TECHNOLOGY**

**HOD  
DEPT.OF CSE**



# COURSE STRUCTURE

# LEGEND

1.1.3	COLOUR
SKILL DEVELOPMENT	
EMPLOYABILITY	
EMPLOYABILITY / SKILL DEVELOPMENT	
ENTREPRENEURSHIP	

## SEMESTER - I

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	19248S11AP	Higher Mathematics	3	1	0	4
I	19250H12P	Adhoc& Sensor Networks	4	0	0	4
I	19250H13P	Advanced Data Structures	4	0	0	4
<b>Practical</b>						
I	19250L14P	Advanced Web Technologies Lab	-	-	3	3
<b>Research Skill Development(RSD) Courses</b>						
I	19250HRSP	Research Led Seminar	1	0	0	1
<b>Total no of Credits</b>					<b>16</b>	

## SEMESTER - II

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250H21P	Middleware Technologies	3	1	0	4
II	19250H22P	Digital Image Processing	4	0	0	4
II	19250E23_P	Elective I	4	0	0	4
<b>Practical</b>						
II	19250L24P	.NET Technologies Lab	-	-	3	3
II	192TECWRP	Technical Writing /Seminars	-	-	3	3
<b>Research Skill Development(RSD) Courses</b>						
II	19250CRMP	Research Methodology	3	0	0	3
II	19250CBRP	Participation in Bounded Research	2	0	0	2
<b>Total no of Credits</b>					<b>23</b>	

### SEMESTER – III

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250H31P	Modern Operating System	4	0	0	4
III	19250E32P	Parallel and High Performance Computing	4	0	0	4
III	19250E33_P	Elective-II	4	0	0	4
<b>Research Skill Development(RSD) Courses</b>						
III	19250CSRP	Design/Socio Technical Project	0	0	4	4
<b>Total no of Credits</b>						<b>16</b>

### SEMESTER – IV

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	19250H41P	Object Oriented Software Engineering	4	0	0	4
IV	19250H42P	Software Project Management	4	0	0	4
IV	19250E43_P	Elective-III	4	0	0	4
IV	19250P44P	Project Work- Phase I	-	-	6	6
<b>Total no of Credits</b>						<b>18</b>

### SEMESTER – V

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
V	19250E51_P	Elective-IV	4	0	0	4
V	19250E52_P	Elective-V	4	0	0	4
V	19250E53_P	Elective-VI	4	0	0	4
<b>Total no of Credits</b>						<b>12</b>

## SEMESTER – VI

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
VI	19250P61P	Project Work- Phase II	0	0	12	12
Total no of Credits					12	

## LIST OF ELECTIVES

### SEMESTER – II ELECTIVE – I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250E23AP	Advanced Distributed Computing	4	0	0	4
II	19250E23BP	Data Warehousing & Data Mining	4	0	0	4
II	19250E23CP	Artificial Neural Networks	4	0	0	4

### SEMESTER – III ELECTIVE – II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E33AP	Multimedia Systems	4	0	0	4
III	19250E33BP	Genetic Algorithms	4	0	0	4
III	19250E33CP	Software Metrics	4	0	0	4

### SEMESTER – IV - ELECTIVE – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250E43AP	Service Oriented Architecture	4	0	0	4
II	19250E43BP	High Speed Networks	4	0	0	4
II	19250E43CP	Embedded Systems	4	0	0	4

### SEMESTER – V - ELECTIVE – IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E51AP	Cloud Computing	4	0	0	4
III	19250E51BP	Information Security	4	0	0	4
III	19250E51CP	Soft Computing	4	0	0	4

### SEMESTER – V - ELECTIVE – V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E52AP	Advanced Database Technology	4	0	0	4
III	19250E52BP	Mobile Communication Computing	4	0	0	4
III	19250E52CP	Green Computing	4	0	0	4

### SEMESTER – V - ELECTIVE – VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E53AP	Software Quality Assurance	4	0	0	4

III	19250E53BP	Bio-Informatics	4	0	0	4
III	19250E53CP	Wireless Application Protocols	4	0	0	4

## CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Courses on *RSD		Project	Total Credit
	Nos	Credit	Nos	Credit	Nos	Credit	Nos	Credit	Credit	
I	3	12	-	-	1	03	1	01	-	16
II	2	08	1	04	2	06	2	05	-	23
III	2	08	1	04	-	-	1	04	-	16
IV	2	08	1	04	-	-	-	-	06	18
V	-	-	3	12	-	-	-	-	-	12
VI	-	-	-	-	-	-	-	-	12	12
<b>Total Credits</b>										<b>97</b>

\*RSD-Research Skill Development

<b>TOTAL CREDITS</b>	
Semester - I	<b>16</b>
Semester - II	<b>23</b>
Semester - III	<b>16</b>
Semester - IV	<b>18</b>
Semester -V	<b>12</b>
Semester -VI	<b>12</b>
<b>TOTAL</b>	<b>97</b>

HOD

DEAN (E&T) DEAN ACADEMICS

VICE CHANCELLOR

# 19248S11A - HIGHER MATHEMATICS

L T P C  
3 1 0 4

## 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 data base 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 –  $a \equiv (mod\ m)$  relations: Partitions sets – Hassee 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 LATICE 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**



## 19250H12 - MODERN OPERATING SYSTEM

L T P C  
4 0 0 4

### 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 audio compression – multimedia scheduling - disk scheduling for multimedia.

### Unit V

9

Case Study – LINUX , WINDOWS VISTA , SYMBIAN OS

**Total : 45 hrs**

### TEXT BOOK:

1. Andrew S. Tanenbaum , “Modern Operating Systems “ , Pearson Education , 3<sup>rd</sup> Edition , 2009

**REFERENCE BOOKS:**

1. Silberschatz, Galvin, Gagne “ Operating System Concepts” Sixth Edition, 2003 .
2. Achut S. Godbole and KahateAtul , “Operating Systems & Systems Programming ”, Tata Mcgraw Hill, 2003.
3. Charles Crowley, “ Operating systems: A Design Oriented Approach”, Tata McGraw Hill, 999.

**19250H13 - PARALLEL AND HIGH PERFORMANCE COMPUTING**

**L T P C**

**4 0 0 4**

**AIM:**

The main objective of this paper is to make the students to know the need of Parallel Computing.

**OBJECTIVES:**

- To understand the models and parameters used.
- To understand the Matrix Algorithms and Design Issues.

**Unit I : Introduction : 9**

Need for Parallel Computing - Scope of Parallel Computing - Issues in Parallel Computing - Parallel Processing Concepts (Overview) - Levels of parallelism (instruction, transaction, task, thread, memory, function) - Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc) -Architectures.

**Unit II : Models of Parallel Computing : 9**

Taxonomy of Parallel Architectures -Dynamic Interconnection Networks - Static Interconnection Networks - Message Transfer - Reduction, Parallel Prefix - GPU thread model.

**Unit III : Performance Modelling : 9**

Metrics – Granularity – Scalability – Overhead – Isoefficiency.

**Unit IV : Matrix Algorithms : 9**

Matrix Partitioning - Matrix Transposition - Matrix Vector Multiply - Matrix Multiply - CUDA, vector add, matrix multiply, sequence alignment - Linear Equations - LU(P) Decomposition

**Unit V : Fundamental Design Issues in Parallel Computing 9**

Synchronization – Scheduling - Job Allocation -Job Partitioning - Dependency Analysis - Mapping Parallel Algorithms onto Parallel Architectures - Performance Analysis of Parallel Algorithms

**Total : 45 hrs**

**TEXTBOOK:**

Introduction to Parallel Computing, 2<sup>nd</sup> Edition- AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar. The Addison Wesley Publishing Company, ISBN 0-201-64865-2.

**REFERENCES :**

“Highly Parallel Computing”, by George S. Almasi and Alan Gottlieb

1. “Advanced Computer Architecture: Parallelism, Scalability, Programmability”, by Kai Hwang, McGraw Hill 1993.
2. ”Parallel Computer Architecture: A hardware/Software Approach”, by David Culler Jaswinder Pal Singh, Morgan Kaufmann, 1999.
3. “Scalable Parallel Computing”, by Kai Hwang, McGraw Hill 1998.
4. “Principles and Practices on Interconnection Networks”, by William James Dally and Brian Towles, Morgan Kauffman 2004.
5. GPU Gems 3 --- by Hubert Nguyen (Chapter 29 to Chapter 41)

**19250H14 -ADHOC AND SENSOR NETWORK**

**L T P C**  
**4 0 0 4**

**AIM:**

To understand the current and emerging applications of the adhoc 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, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

**UNIT II AD-HOC NETWORK ROUTING & TCP 9**

Issues – Classifications 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 SebastinBuettrich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.

**19250H15 - ADVANCED DATA STRUCTURES AND  
ALGORITHMS**

**L T P C  
3 1 0 4**

**AIM:**

To make the learners to 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 :60 hrs**

**REFERENCES**

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures inC++, 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, Printice –Hall,1988.
4. V.S. Subramanian, Principles of Multimedia Database systems, MorganKaufman, 1998.

**CSE/Semester - I**

## **19250L17 -ADVANCED WEB TECHNOLOGIES LAB**

**L T P C**  
**0 0 3 3**

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. Java script for displaying date and comparing two dates.
  - ii. Form Validation including text field, radio buttons, check boxes, 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 reservation 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.

**19250H21 - MIDDLEWARE TECHNOLOGIES**

**L T P C**  
**3 1 0 4**

**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 Web services 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- Exceptionhandling -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- ObjectQuery 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-Tokenmanagement- Introduction to DCOM.

**Total :60hrs**



**REFERENCE BOOKS:**

1. Daniel Serian, "Middleware", Springer Verlag, 1999.
2. Troy Bryan Downing, "Java RMI: Remote Method Invocation", IDG Books India, 2000.
3. Thomas J Mowbray & William A Ruh, "Inside CORBA Distributed Objects and Application", Addison Wesley, 1999.
4. Alan Pope, "CORBA Complete Reference Guide", Addison Wesley, 1998.
5. Don Box, "Essential Com", Addison Wesley, 1999

**19250H22 - OBJECT ORIENTED SOFTWARE ENGINEERING**

**L T P C**  
**4 0 0 4**

**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 StudiesThe laboratory shall include development of systems applying the Software Engineering principles and methods for specific applications.

**Total: 45 hr**

**TEXT BOOKS:**

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. PankajJalote “An Integrated Approach to Software Engineering” Narosa Publishing House 1991
3. Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli “Fudamentals of Software Engineering”Prentice Hall of India 2002.
4. Fairley, “Software Engineering Concepts”, Mc.Graw Hill 1985.

**CSE/Semester - II**

**19250H23 - DIGITAL IMAGE PROCESSING**

**L T P C**  
**4 0 0 4**



3. Sid Ahmed, Image Processing, McGraw Hill, New York, 1995.

**CSE/Semester - II**

## **19250CRM - RESEARCH METHODOLOGY**

**L T P C**  
**3 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:**

- 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 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.

## 17250H31 - SOFTWARE PROJECT MANAGEMENT

L T P C  
4 0 0 4

### 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.

### UNIT I FUNDAMENTALS

9

Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management.

### UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK

9

Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process.

### UNIT III SOFTWARE MANAGEMENT DISCIPLINES

9

Iterative Process Planning – Organization and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process.

### UNIT IV MANAGED AND OPTIMIZED PROCESS

9

Data Gathering and Analysis – Principles of Data Gathering – Data Gathering Process – Software Measures – Data Analysis – Managing Software Quality – Defect Prevention.

### UNIT V CASE STUDIES

9

COCOMO Cost Estimation Model – Change Metrics – CCPDS–R.

**Total: 45hrs**

### TEXT BOOKS:

1. Walker Royce “Software Project Management A Unified Framework”, Pearson Education, 2004
2. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989. (Unit IV)

### REFERENCES:

1. Ramesh Gopaldaswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
2. Bob Hughes, Mikecoterrell, “Software Project Management”, 3rd Edition, Tata cGraw Hill, 2004.

**SEMESTER - I - ELECTIVE - I**  
**19250E16A - MULTIMEDIA SYSTEMS**

**L T P C**  
**4 0 0 4**

**AIM:**

To impart knowledge on Multimedia system and design.

**OBJECTIVES:**

- To study the graphics techniques and algorithms.
- To study the multimedia concepts and various I/O technologies

**UNIT 1 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 Andleigh 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, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”, Pearson Education, second edition 2003.

## 19250E16B- GENETIC ALGORITHMS

L T P C

4 0 0 4

### 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 GAs 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, multi objective optimization, knowledge based techniques, genetic algorithms & parallel processors.

**Total : 45hrs**

### TEXT BOOKS:



1. David E. Goldberg, “Genetic algorithms in search, optimization & Machine Learning”  
Pearson Education, 2006

***CSE/Elective -I/Semester - I***

**REFERENCE BOOKS:**

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

## 19250E16C - SOFTWARE METRICS

L T P C  
4 0 0 4

### 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 PRODUCTS 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

**19250E24A - ADVANCED DISTRIBUTED COMPUTING**

**L T P C**  
**4 0 0 4**

**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 - Levels of Distribution Transparency -Reference Architecture for Distributed Databases - Types of Data Fragmentation - Integrity Constraints in Distributed Databases.

**Total : 45 hrs**  
**CSE/Elective -II/Semester - II**

**TEXT BOOKS :**

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 SapeMullender, “Distributed Systems”, Addison Wesley, 2 nd Edition, 1993.

2 Albert Fleishman, “Distributes Systems - Software Design and Implementation”, Springer - Verlag, 1994.

3 M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Education, 2004.

4 Andrew S Tanenbaum, Maartenvan Steen,”Distibuted Systems –Principles and Pardigms”,Pearson Education, 2002.

5 Mugesh Singhal,Niranjan G Shivaratri,”Advanced Concepts in Operating Systems”,Tata McGraw Hill Edition, 2001.

1. Principles of Distributed Database Systems, M.Tamer Ozsu, Patrick Valduriez –Pearson Education

## **19250E24B- DATA WAREHOUSING & DATA MINING**

**L T P C**  
**4 0 0 4**

### **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 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.

***CSE/Elective -II/Semester - II***

**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.

## **19250E24C- ARTIFICIAL NEURAL NETWORKS**

**L T P C**  
**4 0 0 4**

### **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 feed forward neural networks

**UNIT-I Introduction to artificial neural networks 9**  
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 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 Feed forward 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**

***CSE/Elective -II/Semester - II***

**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



## **19250E25A- SERVICE ORIENTED ARCHITECTURE**

**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 s a service – SOA technologies – proof-of-concept – process orchestration – SOA best practices

**UNIT IV**

**9**

Meta data 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 coodination – transaction 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.

## **19250E25B - HIGH SPEED NETWORKS**

**L T P C**  
**4 0 0 4**

### **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 concept learnt in this course to optimize and troubleshoot high-speed network.
- Demonstrate the knowledge of network planning and optimization

### **UNIT - 1 : HIGH SPEED 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 Frame work, 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, RTP.

**Total: 45 hrs**

***CSE/Elective -III/Semester - II***

**TEXT BOOK:**

1. William Stallings, "HIGH SPEED 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

## **19250E25C- EMBEDDED SYSTEMS**

**L T P C**  
**4 0 0 4**

### **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 – IIRTS.

### **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++ - Objected 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.

***CSE/Elective -III/Semester - II***

**UNIT-V REAL TIME OPERATING SYSTEMS – PART - 2**

**9**

Study of RTOS, VxWorks - Basic Features - Task Management Library at the System - Library Header File - VxWorks System Functions and System Tasks - Inter Process (Task) Communication Functions - Case Study of Coding for Sending Application Layer Byte Streams on a TCP/IP Network Using RTOS Vxworks

**Total : 45hrs**

**REFERENCE:**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw Hill, First reprint 2003
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.

## **19250E32A - CLOUD COMPUTING**

**L T P C**  
**4 0 0 4**

**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**

***CSE/Elective -IV/Semester - III***

**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, Wile, 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

## **19250E32B - INFORMATION SECURITY**

**L T P C**  
**4 0 0 4**

**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 become aware of various standards in this area.
- To know the technological aspects of Information Security.

**UNIT-I**

**9**

An overview of Computer Security, Access Control Matrix, Security Policies, Confidentiality Polices, Integrity policies and Hybrid Policies

**UNIT-II**

**9**

Cryptography- Key Management- Session and Interchange and generation, Cryptography Key Infrastructure, Storing and revoking Keys, Digital Signature, Cipher Techniques

**UNIT-III**

**9**

Systems: Design Principle, Representing Identity, Access Control Mechanisms, Information flow and Confinement Problems

**UNIT-IV**

**9**

Malicious logic, Vulnerability Analysis, Auditing and Intrusion Detection

**UNIT-V**

**9**

Network Security, System Security, User Security and Program Security.

**Total:45hrs**

**TEXT BOOK:**

Matt Bishop, "Computer Security arts and science" 2<sup>nd</sup> edition, Pearson Education

**REFERENCE BOOK:**

1. Mark Merkow, James Breithaupt, " Information Security: Principles and Practices", 1<sup>st</sup> edition, Pearson Education.
2. Whitman, "Principles of Information Security", 2<sup>nd</sup> edition, Pearson Education



3. William Stallings, “Cryptography and Network Security: Principles and Practices”, 3<sup>rd</sup> edition, Pearson Education.
4. Charles P Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, 3<sup>rd</sup> edition

**CSE/Elective –IV/Semester – III**

## **19250E32C - SOFT COMPUTING**

**L T P C**  
**4 0 0 4**

**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 base 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 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 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.

***CSE/Elective –IV/Semester – III***

**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. Sun and E. Mizutani, “Neuro Fuzzy and Soft Computing”, PHI, Pearson Education, 2004.

**REFERENCES:**

1. Timothy J. Ross, “Fuzzy Logic with Engineering Application “, McGraw Hill, 1977.
2. Davis E. Goldberg, “Genetic Algorithms Search, Optimization and Machine Learning”, Addison Wesley, 1989.
3. S. Rajasekaran and G. A. V. Pai, ”Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
4. R. Eberhart, P. Simpson and R. Dobbins, ”Computational Intelligence PC Tools”, AP Professional, Boston, 1996.

**19250E33A - ADVANCED DATABASE TECHNOLOGY**

**L T P C**  
**4 0 0 4**

**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 = 45 hrs**

**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.

**19250E33B - MOBILE COMMUNICATION AND COMPUTING**

**L T P C**  
**4 0 0 4**

**AIM:**

To understand the mobile computing and mobile application development.

**OBJECTIVES:**

- Learning the basics of Wireless voice and data communications technologies.
- Enhancing working knowledge on various telephone and satellite networks.
- studying the working principles of wireless LAN and its standards.
- Studying various wireless operating systems.

**UNIT-I**

**9**

**Introduction :** Evolution of Mobile Computing – Important terminologies - Mobile computing functions – Mobile computing Devices – Networks: Wireline, Wireless , Adhoc - Comparison of wired and wireless mechanism - Various types of wireless communication technologies used in Mobiles, Antennas - **Architecture : Architecture of Mobile Computing** – 3- Tier Architecture – Presentation ( Tier-1), Application ( Tier -2), Data ( Tier – 3).

**UNIT-II:**

**9**

**Mobile computing through Telephony:** Evolution through telephony – Multiple Access Procedures: FDMA, TDMA, CDMA, SDMA – features – Satellite Communication System : Communicating through satellite – Low orbit satellite – **Medium orbit satellite** – Geo stationary Satellite – Satellite phones

**UNIT-III**

**9**

**Wireless LAN:** Introduction - Definition – **Applications of WLAN** – Infrared versus Radio transmission – Features of WI-FI and WI-MAX - Roaming Issues.

**UNIT-IV**

**9**

**Mobile Transport Layer:** Traditional TCP - **Congestion control - Slow start** - Fast retransmit & fast recovery - Transmission / time out freezing - Selective retransmission – Indirect TCP – Snooping TCP – Mobile TCP

**UNIT-V**

**9**

**Wireless Application languages and operating systems** - Understanding of Wireless Application languages - XML, JAVA, **J2ME, JAVA CARD** - Understanding of Mobile operating system - Palm OS, Windows CE , Android

**Total :45hrs**

***CSE/Elective –V/Semester – III***

**REFERENCES:**

1. Mobile Computing - Raj Kamal OXFORD Second Edition -2012
2. Wireless Communication and Networks - William Stallings PHI , New Delhi 1st edition.
3. Wireless Communications and Networks – 3 G and Beyond ITI SahaMisra TMGH, New Delhi Third reprint 2011
4. Wireless and Mobile Networks Concepts and protocols - Dr.Sunilkumar S.Manvi & Mahabaleshwar S.Kakkasageri - Wiley Publisher First Edition
5. Mobile Computing - Dr.N.N. Jani, Kamaljit I.Lakhtara, dr.Ashish N.Jani, Neeta Kanabar S.Chand and Co,- New Delhi Reprint 2011
6. Mobile Computing Theory and Practice - Kumkum Gay Pearson Eduction 2010
7. Mobile Computing for Beginneris - Raksha Shende Shroff Publishers and Distributors - First Edition -Feb 2012.

## **19250E33C - GREEN COMPUTING**

**L T P C**  
**4 0 0 4**

### **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.

<b>UNIT-I</b> Origins, Regulations and industry initiatives- <b>Government, Industry.</b>	<b>9</b>
<b>UNIT-II</b> Approaches to green computing- <b>Product longevity</b> , Algorithmic efficiency.	<b>9</b>
<b>UNIT-III</b> Resource allocation, Virtualization.	<b>9</b>
<b>UNIT-IV</b> Terminal servers, Power management, <b>Operating system support</b> , Power supply, Storage, Video card, Display.	<b>9</b>
<b>UNIT-V</b> Web, Temporal and Spatial Data Mining Materials recycling, Telecommuting, Middleware support for green computing, Tools for monitoring, <b>HPC computing, Green Mobile</b> , embedded computing and networking, Management Frameworks Standards and metrics for computing green	<b>9</b>

**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.

## 19250E34A - SOFTWARE QUALITY ASSURANCE

L T P C  
4 0 0 4

### 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 – adhoc 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.

**CSE/Elective –VI/Semester – III**

## **19250E34B - BIO-INFORMATICS**

**L T P C**  
**4 0 0 4**

### **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**

**TEXT BOOK:**

1. Bryan Bergeron, "Bio Informatics 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, "Bio Informatics The Machine Learning Approach", 2nd Edition, First East West Press, 2003.

## **19250E34C - WIRELESS APPLICATION PROTOCOLS**

**L T P C**  
**4 0 0 4**

**AIM:**

To introduction 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 applicaitions.

**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(UDPYWEMP** 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**

**TEXT BOOKS :**

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 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	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 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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**DEPARTMENT OF**  
**COMPUTER SCIENCE & ENGINEERING**

**PROGRAM HANDBOOK**

**M.Tech**  
**COMPUTER SCIENCE AND ENGINEERING**  
[FULL TIME]

[REGULATION 2019]  
*[For candidates admitted to M.Tech CSE program from June 2017 onwards]*


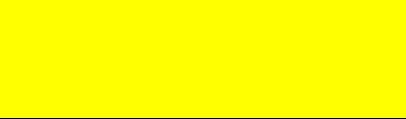


DEAN  
ENGINEERING AND TECHNOLOGY

HOD  
DEPT.OF CSE



# COURSE STRUCTURE

# LEGEND

1.1.3	COLOUR
SKILL DEVELOPMENT	
EMPLOYABILITY	
EMPLOYABILITY / SKILL DEVELOPMENT	
ENTREPRENEURSHIP	

## SEMESTER – I

Semester . no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	19248S11A	Higher Mathematics	3	1	0	4
I	19250C12	Modern Operating System	4	0	0	4
I	19250C13	Parallel and High Performance Computing	4	0	0	4
I	19250C14	Adhoc and Sensor Network	4	0	0	4
I	19250C15	Advanced Data Structures and Algorithms	4	1	0	4
I	19250E16_	Elective - I	3	0	0	3
<b>Practical</b>						
I	19250L17	Advanced Web Technologies Lab	0	0	3	3
<b>Research Skill Development(RSD) Courses</b>						
I	19250CRS	Research Led Seminar	0	0	0	1
<b>Total no of Credit</b>					<b>27</b>	

## SEMESTER – II

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250C21	Middleware Technologies	3	1	0	4
II	19250C22	Object Oriented Software Engineering	4	0	0	4
II	19250C23	Digital Image Processing	4	0	0	4
II	19250E24_	Elective II	3	0	0	3
II	19250E25_	Elective - III	3	0	0	3
<b>Practical</b>						
II	19250L26	.NET Technologies Lab	0	0	3	3
II	192TECWR	Technical Writing /Seminars	0	0	3	3
<b>Research Skill Development(RSD) Courses</b>						
II	19250CRM	Research Methodology	3	0	0	3
II	19250CBR	Participation in Bounded Research	2	0	0	2
<b>Total no of Credit</b>					<b>29</b>	

## SEMESTER – III

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250C31	Software Project Management	4	0	0	4
III	19250E32_	Elective-IV	4	0	0	3
III	19250E33_	Elective-V	4	0	0	3
III	19250E34_	Elective-VI	4	0	0	3
III	19250P35	Project Work- Phase I	-	-	10	10
<b>Research Skill Development(RSD) Courses</b>						
III	19250CSR	Design/Socio Technical Project	0	0	0	6
<b>Total no of Credit</b>						<b>29</b>

### **SEMESTER – IV**

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	19250P41	Project Work- Phase II	-	-	15	15
<b>Total no of Credit</b>						<b>15</b>

## CREDITS DISTRIBUTION

Semester	Core Theory Courses		Elective Courses		Practical Courses		Courses on *RSD		Project		Total Credits
	Nos	Credits	Nos	Credits	Nos	Credits	Nos	Credits	Nos	Credits	
I	05	20	01	03	01	03	01	01	-	-	27
II	03	12	02	06	02	06	02	05	-	-	29
III	01	04	03	09	-	-	01	06	01	10	29
IV	-	-	-	-	-	-	-	-	01	15	15
<b>Total Credits</b>											<b>100</b>

\*RSD-Research Skill Development

<b>TOTAL CREDITS</b>	
Semester - I	<b>27</b>
Semester - II	<b>29</b>
Semester - III	<b>29</b>
Semester - IV	<b>15</b>
<b>TOTAL</b>	<b>100</b>

## LIST OF ELECTIVES

### SEMESTER – I - ELECTIVE – I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	19250E16A	Multimedia Systems	3	0	0	3
I	19250E16B	Genetic Algorithms	3	0	0	3
I	19250E16C	Software Metrics	3	0	0	3

### SEMESTER – II - ELECTIVE – II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250E24A	Advanced Distributed Computing	3	0	0	3
II	19250E24B	Data Warehousing & Data Mining	3	0	0	3
II	19250E24C	Artificial Neural Networks	3	0	0	3

### SEMESTER – II - ELECTIVE – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	19250E25A	Service Oriented Architecture	3	0	0	3
II	19250E25B	High Speed Networks	3	0	0	3
II	19250E25C	Embedded Systems	3	0	0	3

**SEMESTER – III - ELECTIVE – IV**

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E32A	Cloud Computing	3	0	0	3
III	19250E32B	Information Security	3	0	0	3
III	19250E32C	Soft Computing	3	0	0	3

**SEMESTER – III - ELECTIVE – V**

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E33A	Advanced Database Technology	3	0	0	3
III	19250E33B	Mobile Communication and Computing	3	0	0	3
III	19250E33C	Green Computing	3	0	0	3

**SEMESTER – III - ELECTIVE – VI**

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	19250E34A	Software Quality Assurance	3	0	0	3
III	19250E34B	Bio-Informatics	3	0	0	3
III	19250E34C	Wireless Application Protocols	3	0	0	3

## 19248S11AP - HIGHER MATHEMATICS

L T P C  
3 1 0 4

### 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 data base 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 –  $a = (\text{mod } m)$  relations: Partitions sets – Hassee 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<sub>0</sub> – 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**

## 19250H12P - MODERN OPERATING SYSTEM

**L T P C**  
**4 0 0 4**

**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 - **virtulazitation** - distributed systems - multimedia operating systems . Multimedia files - video compression audio compression – multimedia scheduling - disk scheduling for multimedia.

**Unit V**

**9**

Case Study – LINUX , WINDOWS VISTA , SYMBIAN OS

**Total : 45 hrs**

**TEXT BOOK:**

1. Andrew S. Tanenbaum , “Modern Operating Systems “ , Pearson Education , 3<sup>rd</sup> Edition , 2009

***CSE/Semester - I***

**REFERENCE BOOKS:**

1. Silberschatz, Galvin, Gagne “ Operating System Concepts” Sixth Edition, 2003 .
2. Achut S. Godbole and KahateAtul , “Operating Systems & Systems Programming ”, Tata Mcgraw Hill, 2003.
3. Charles Crowley, “ Operating systems: A Design Oriented Approach”, Tata McGraw Hill, 999.

**19250H13P - PARALLEL AND HIGH PERFORMANCE  
COMPUTING**

**L T P C  
4 0 0 4**

**AIM:**

The main objective of this paper is to make the students to know the need of Parallel Computing.

**OBJECTIVES:**

- To understand the models and parameters used.
- To understand the Matrix Algorithms and Design Issues.

**Unit I : Introduction : 9**

Need for Parallel Computing - Scope of Parallel Computing - Issues in Parallel Computing - Parallel Processing Concepts (Overview) - Levels of parallelism (instruction, transaction, task, thread, memory, function) - Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc) -Architectures.

**Unit II : Models of Parallel Computing : 9**

Taxonomy of Parallel Architectures -Dynamic Interconnection Networks - Static Interconnection Networks - Message Transfer - Reduction, Parallel Prefix - GPU thread model.

**Unit III : Performance Modelling : 9**

Metrics – Granularity – Scalability – Overhead – Isoefficiency.

**Unit IV : Matrix Algorithms : 9**

Matrix Partitioning - Matrix Transposition - Matrix Vector Multiply - Matrix Multiply - CUDA, vector add, matrix multiply, sequence alignment - Linear Equations - LU(P) Decomposition

**Unit V : Fundamental Design Issues in Parallel Computing 9**

**Synchronization – Scheduling - Job Allocation** -Job Partitioning - Dependency Analysis - Mapping Parallel Algorithms onto Parallel Architectures - Performance Analysis of Parallel Algorithms

**Total : 45 hrs**

***CSE/Semester - I***

**TEXTBOOK:**

Introduction to Parallel Computing, 2<sup>nd</sup> Edition- AnanthGrama, Anshul Gupta, George Karypis, Vipin Kumar. The Addison Wesley Publishing Company, ISBN 0-201-64865-2.

**REFERENCES :**

“Highly Parallel Computing”, by George S. Almasi and Alan Gottlieb

1. “Advanced Computer Architecture: Parallelism, Scalability, Programmability”, by Kai Hwang, McGraw Hill 1993.
2. ”Parallel Computer Architecture: A hardware/Software Approach”, by David Culler Jaswinder Pal Singh, Morgan Kaufmann, 1999.
3. “Scalable Parallel Computing”, by Kai Hwang, McGraw Hill 1998.
4. “Principles and Practices on Interconnection Networks”, by William James Dally and Brian Towles, Morgan Kauffman 2004.
5. GPU Gems 3 --- by Hubert Nguyen (Chapter 29 to Chapter 41)

## 19250H14P -ADHOC AND SENSOR NETWORK

L T P C  
4 0 0 4

### AIM:

To understand the current and emerging applications of the adhoc 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, Classifications of MAC protocols, Multi channel MAC & Power control MAC protocol.

### UNIT II AD-HOC NETWORK ROUTING & TCP 9

Issues – Classifications 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. 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, Printice –Hall,1988.
4. V.S. Subramanian, Principles of Multimedia Database systems, MorganKaufman, 1998.

**CSE/Semester - I**

## **19250L17 -ADVANCED WEB TECHNOLOGIES LAB**

**L T P C**  
**0 0 3 3**

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. Java script for displaying date and comparing two dates.
  - ii. Form Validation including text field, radio buttons, check boxes, 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 reservation 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.

## 19250H21 - MIDDLEWARE TECHNOLOGIES

L T P C  
3 1 0 4

### 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 Web services 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- Exceptionhandling -pre Compiler Directives -OO Design using IDL.

### UNIT – IV

9+3

**CORBA:** CORBA 2 Standard- Standard Object model- CORBA Architecture-CORBAClient and Object Implementation- Interface & Implementation repository-CORBA Services- Key Issues- Naming Services -Relationships- **Event Services**- life Cycle services- ObjectQuery Services-properties Services-Time Services- CORBA facilities & CORBA Domains.



**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**

**REFERENCE BOOKS:**

1. Daniel Serian, "Middleware", Springer Verlag, 1999.
2. Troy Bryan Downing, "Java RMI: Remote Method Invocation", IDG Books India, 2000.
3. Thomas J Mowbray & William A Ruh, "Inside CORBA Distributed Objects and Application", Addison Wesley, 1999.
4. Alan Pope, "CORBA Complete Reference Guide", Addison Wesley, 1998.
5. Don Box, "Essential Com", Addison Wesley, 1999

**17250H22 - OBJECT ORIENTED SOFTWARE ENGINEERING**

**L T P C**  
**4 0 0 4**

**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**

**TEXT BOOKS:**

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. PankajJalote “An Integrated Approach to Software Engineering” Narosa Publishing House 1991
3. Carlo Ghezzi Mehdi Jazayer, Dino Mandrioli “Fudamentals of Software Engineering”Prentice Hall of India 2002.
4. Fairley, “Software Engineering Concepts”, Mc.Graw Hill 1985.



**REFERENCES:**

1. Gonzalez.R.C& Woods. R.E., Digital Image Processing, 2<sup>nd</sup>Edition, Pearson Education, 2002.
2. Anil Jain.K, Fundamentals of Digital image Processing, Prentice Hall of India, 1989.
3. Sid Ahmed, Image Processing, McGraw Hill, New York, 1995.

**19250L26 - .NET TECHNOLOGIES LAB**

**L T P C**  
**0 0 3 3**

**Develop the following in ASP .NET or VB.NET.**

1. Query textbox and Displaying records
2. Display records by using database
3. Datalist link control
4. Databinding using dropdownlist control
5. Datagrid paging

**Develop the following in C#.NET.**

1. Demonstrate Use Of Virtual 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.

## **19250CRM - RESEARCH METHODOLOGY**

**L T P C**  
**3 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:**

- 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 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.



## 19250H31 - SOFTWARE PROJECT MANAGEMENT

L T P C  
4 0 0 4

### 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.

**UNIT I FUNDAMENTALS 9**  
Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management.

**UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9**  
Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process.

**UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9**  
Iterative Process Planning – Organization and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process.

**UNIT IV MANAGED AND OPTIMIZED PROCESS 9**  
Data Gathering and Analysis – Principles of Data Gathering – Data Gathering Process – Software Measures – Data Analysis – Managing Software Quality – Defect Prevention.

**UNIT V CASE STUDIES 9**  
COCOMO Cost Estimation Model – Change Metrics – CCPDS–R.

**Total: 45hrs**

### TEXT BOOKS:

1. Walker Royce “Software Project Management A Unified Framework”, Pearson Education, 2004
2. Humphrey Watts, “Managing the software process”, Addison Wesley, 1989. (Unit IV)

### REFERENCES:

1. Ramesh Gopalswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
2. Bob Hughes, Mikecoterrell, “Software Project Management”, 3rd Edition, Tata cGraw Hill, 2004.

**SEMESTER - I - ELECTIVE - I**

**19250E16A - MULTIMEDIA SYSTEMS**

**L T P C**  
**4 0 0 4**

**AIM:**

To impart knowledge on Multimedia system and design.

**OBJECTIVES:**

- To study the graphics techniques and algorithms.
- To study the multimedia concepts and various I/O technologies

**UNIT 1 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 Andleigh 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, Vandam, Feiner, Huges, “Computer Graphics: Principles & Practice”, Pearson Education, second edition 2003.

**19250E16B- GENETIC ALGORITHMS**

**L T P C**  
**4 0 0 4**

**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 GAs 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, multi objective optimization, knowledge based techniques, genetic algorithms & parallel processors.

**Total : 45hrs**

**TEXT BOOKS:**

1. David E. Goldberg, “Genetic algorithms in search, optimization & Machine Learning”  
Pearson Education, 2006

***CSE/Elective -I/Semester - I***

**REFERENCE BOOKS:**

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

**19250E16C - SOFTWARE METRICS**

**L T P C**  
**4 0 0 4**

**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 PRODUCTS 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

**19250E24A - ADVANCED DISTRIBUTED COMPUTING**

**L T P C**  
**4 0 0 4**

**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 - Levels of Distribution Transparency -Reference Architecture for Distributed Databases - **Types of Data Fragmentation - Integrity Constraints in Distributed Databases.**

**Total : 45 hrs**  
**CSE/Elective -II/Semester - II**

**TEXT BOOKS :**

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 SapeMullender, “Distributed Systems”, Addison Wesley, 2 nd Edition, 1993.

2 Albert Fleishman, “Distributes Systems - Software Design and Implementation”, Springer - Verlag, 1994.

3 M.L.Liu, “Distributed Computing Principles and Applications”, Pearson Education, 2004.

4 Andrew S Tanenbaum, Maartenvan Steen,”Distibuted Systems –Principles and Pardigms”,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

**19250E24B- DATA WAREHOUSING & DATA MINING**

**L T P C**  
**4 0 0 4**

**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 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**





**19250E24C- ARTIFICIAL NEURAL NETWORKS**

**L T P C**  
**4 0 0 4**

**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 feed forward neural networks

**UNIT-I Introduction to artificial neural networks 9**  
**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 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 Feed forward 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**

***CSE/Elective -II/Semester - II***

**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

**19250E25A- SERVICE ORIENTED ARCHITECTURE**

**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**

Meta data 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: 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.

## 19250E25B - HIGH SPEED NETWORKS

L T P C  
4 0 0 4

### 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 concept learnt in this course to optimize and troubleshoot high-speed network.
- Demonstrate the knowledge of network planning and optimization

### UNIT - 1 : HIGH SPEED 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 Frame work, 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, RTP.

**Total: 45 hrs**

***CSE/Elective -III/Semester - II***

**TEXT BOOK:**

1. William Stallings, "HIGH SPEED 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

**19250E25C- EMBEDDED SYSTEMS**

**L T P C**  
**4 0 0 4**

**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++** - Objected 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.

***CSE/Elective -III/Semester - II***

**UNIT-V REAL TIME OPERATING SYSTEMS – PART - 2**

**9**

Study of RTOS, VxWorks - Basic Features - Task Management Library at the System - Library Header File - VxWorks System Functions and System Tasks - Inter Process (Task) Communication Functions - Case Study of Coding for Sending Application Layer Byte Streams on a TCP/IP Network Using RTOS Vxworks

**Total : 45hrs**

**REFERENCE:**

1. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw Hill, First reprint 2003
2. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.



**19250E32A - CLOUD COMPUTING**

**L T P C**  
**4 0 0 4**

**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**

***CSE/Elective -IV/Semester - III***

**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, Wile, 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

**19250E32B - INFORMATION SECURITY**

**L T P C**  
**4 0 0 4**

**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 become aware of various standards in this area.
- To know the technological aspects of Information Security.

**UNIT-I**

**9**

An overview of Computer Security, Access Control Matrix, Security Policies, Confidentiality Polices, Integrity policies and Hybrid Policies

**UNIT-II**

**9**

Cryptography- Key Management- Session and Interchange and generation, Cryptography Key Infrastructure, Storing and revoking Keys, Digital Signature, Cipher Techniques

**UNIT-III**

**9**

Systems: Design Principle, Representing Identity, Access Control Mechanisms, Information flow and Confinement Problems

**UNIT-IV**

**9**

Malicious logic, Vulnerability Analysis, Auditing and Intrusion Detection

**UNIT-V**

**9**

Network Security, System Security, User Security and Program Security.

**Total:45hrs**

**TEXT BOOK:**

Matt Bishop, "Computer Security arts and science" 2<sup>nd</sup> edition, Pearson Education

**REFERENCE BOOK:**

1. Mark Merkow, James Breithaupt, "Information Security: Principles and Practices", 1<sup>st</sup> edition, Pearson Education.
2. Whitman, "Principles of Information Security", 2<sup>nd</sup> edition, Pearson Education

3. William Stallings, “Cryptography and Network Security: Principles and Practices”, 3<sup>rd</sup> edition, Pearson Education.
4. Charles P Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, 3<sup>rd</sup> edition

**CSE/Elective –IV/Semester – III**

## **19250E32C - SOFT COMPUTING**

**L T P C**  
**4 0 0 4**

**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 base 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 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 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.**

***CSE/Elective –IV/Semester – III***

#### **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. Sun and E. Mizutani, “Neuro Fuzzy and Soft Computing”, PHI, Pearson Education, 2004.

#### **REFERENCES:**

1. Timothy J. Ross, “Fuzzy Logic with Engineering Application “, McGraw Hill, 1977.
2. Davis E. Goldberg, “Genetic Algorithms Search, Optimization and Machine Learning”, Addison Wesley, 1989.
3. S. Rajasekaran and G. A. V. Pai, ”Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
4. R. Eberhart, P. Simpson and R. Dobbins, ”Computational Intelligence PC Tools”, AP Professional, Boston, 1996.

**19250E33A - ADVANCED DATABASE TECHNOLOGY**

**L T P C**  
**4 0 0 4**

**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 = 45 hrs**

***CSE/Elective -V/Semester - III***

**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.

**19250E33B - MOBILE COMMUNICATION AND COMPUTING**

**L T P C**  
**4 0 0 4**

**AIM:**

To understand the mobile computing and mobile application development.

**OBJECTIVES:**

- Learning the basics of Wireless voice and data communications technologies.
- Enhancing working knowledge on various telephone and satellite networks.
- studying the working principles of wireless LAN and its standards.
- Studying various wireless operating systems.

**UNIT-I**

**9**

**Introduction :** Evolution of Mobile Computing – Important terminologies - Mobile computing functions – Mobile computing Devices – Networks: Wireline, Wireless , Adhoc - Comparison of wired and wireless mechanism - Various types of wireless communication technologies used in Mobiles, Antennas - **Architecture :** Architecture of Mobile Computing – 3- Tier Architecture – Presentation ( Tier-1), Application ( Tier -2), Data ( Tier – 3).

**UNIT-II:**

**9**

**Mobile computing through Telephony:** Evolution through telephony – Multiple Access Procedures: **FDMA, TDMA, CDMA, SDMA** – features – Satellite Communication System : Communicating through satellite – Low orbit satellite – Medium orbit satellite – Geo stationary Satellite – Satellite phones

**UNIT-III**

**9**

**Wireless LAN:** Introduction - Definition – **Applications of WLAN** – Infrared versus Radio transmission – Features of WI-FI and WI-MAX - Roaming Issues.

**UNIT-IV**

**9**

**Mobile Transport Layer:** **Traditional TCP** - Congestion control - Slow start - Fast retransmit & fast recovery - Transmission / time out freezing - Selective retransmission – Indirect TCP – Snooping TCP – Mobile TCP



## UNIT-V

9

**Wireless Application languages and operating systems** - Understanding of Wireless Application languages - XML, JAVA, J2ME, JAVA CARD - Understanding of Mobile operating system - Palm OS, Windows CE , Android

**Total :45hrs**

***CSE/Elective –V/Semester – III***

### REFERENCES:

1. Mobile Computing - Raj Kamal OXFORD Second Edition -2012
2. Wireless Communication and Networks - William Stallings PHI , New Delhi 1st edition.
3. Wireless Communications and Networks – 3 G and Beyond ITI SahaMisra TMGH, New Delhi Third reprint 2011
4. Wireless and Mobile Networks Concepts and protocols - Dr.Sunilkumar S.Manvi & Mahabaleshwar S.Kakkasageri - Wiley Publisher First Edition
5. Mobile Computing - Dr.N.N. Jani, Kamaljit I.Lakhtara, dr.Ashish N.Jani, Neeta Kanabar S.Chand and Co,- New Delhi Reprint 2011
6. Mobile Computing Theory and Practice - Kumkum Gay Pearson Education 2010
7. Mobile Computing for Beginneris - Raksha Shende Shroff Publishers and Distributors - First Edition -Feb 2012.

**19250E33C - GREEN COMPUTING**

**L T P C**  
**4 0 0 4**

**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 system 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-Grow Hill
3. The Greening of IT-How Companies Can Make a Difference for the Environment by John Lamb.

**CSE/Elective –VI/Semester – III**

## **19250E34A - SOFTWARE QUALITY ASSURANCE**

**L T P C**  
**4 0 0 4**

### **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 – adhoc 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.

**CSE/Elective –VI/Semester – III**

## 19250E34B - BIO-INFORMATICS

**L T P C**  
**4 0 0 4**

### 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**

***CSE/Elective –VI/Semester – III***

**TEXT BOOK:**

1. Bryan Bergeron, “Bio Informatics 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, “Bio Informatics The Machine Learning Approach”, 2nd Edition, First East West Press, 2003.

**19250E34C - WIRELESS APPLICATION PROTOCOLS**

**L T P C**  
**4 0 0 4**

**AIM:**

To introduction 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 applicaitions.

**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(UDPYWEMP 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**

**TEXT BOOKS :**

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 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	12
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➤ **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 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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**PRIST**  
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THANJAVUR – 613 403 - TAMILNADU

# **DEPARTMENT OF COMMERCE**

**M.ComSYL  
LABUS**

**(REGULATION 2019)**

## **M.COMPROGRAMME**

The students of commerce today occupy key position both in public and private sector. They are able to make plan for the promotion and development of industry. The aim of the M.Com programme is to produce professional managers, accountants and innovative businessmen. M.Com programme requires advanced commercial knowledge and understanding of Corporate Accounting, Human Resource Management, Financial Management, Globalization Aspects etc. the post graduate students in commerce are able to prove themselves as a good manager and have a creative and helpful in problem solving.

Students of Commerce should possess knowledge power to develop new ideas and applications to latest information technology in the business and are able to implement these ideas in practice. At this backdrop, the syllabus for the M.Com programme of the **PRIST UNIVERSITY** is designed.



**PRIST**  
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THANJAVUR – 613 403 - TAMILNADU

**SCHOOL OF COMMERCE AND MANAGEMENT DEPARTMENT**

**ENT OF COMMERCE**

**M.Com–**

**REGULATION 2019 COURSE STRUCTURE**

**CTURE**

Course Code	Course Title	L	T	C
<b>SEMESTER-I</b>				
19261SEC11	Marketing research and Consumer Behavior	6	0	4
19261SEC12	Human Resource management	6	0	4
19261SEC13	Services Marketing	5	0	4
19261SEC14	Advanced Cost Management	6	1	4
19261DSC15--	Discipline Specific Elective-I	5	0	4
19261RLS16	Research Led Seminar	-	-	1
	<b>Total</b>	<b>28</b>	<b>1</b>	<b>21</b>
<b>SEMESTER-II</b>				
19261SEC21	Quantitative Techniques For Decision Making	5	1	4
19261SEC22	Total Quality Management	5	0	4
19261SEC23	Advanced Management Accounting	5	1	4
19261SEC24	Securities Analysis and Portfolio Management	5	0	4
19261DSC25 -	Discipline Specific Elective –II	5	0	4
19261RMC26	Research Methodology	3	0	2
19261BRC27	Participation in Bounded Research	-	-	2
	<b>Total</b>	<b>28</b>	<b>2</b>	<b>24</b>
<b>SEMESTER-III</b>				
19261SEC31	Project Planning and Control	5	1	5
19261SEC32	Advanced Corporate Accounting	5	2	5
19261SEC33	Investment Management	5	2	5
19261DSC34 -	Discipline Specific Elective –III	5	0	4
192--OEC35	Open Elective	4	0	3
19261SRC36	Participation in Scaffold Research (Societal Project)	-	-	2
	<b>Total</b>	<b>24</b>	<b>5</b>	<b>24</b>
<b>SEMESTER-IV</b>				
19261SEC41	Income Tax Law and Tax Planning	5	2	5
19261SEC42	International Business	5	1	5
19261SEC43	Co-Operation in India and Abroad	5	1	5
19261DSC44 -	Discipline Specific Elective-IV	5	0	4
19261PRW45	Project Work	-	-	6
19261PEE	Program– Exit Examination			2

	<b>Total</b>	<b>20</b>	<b>4</b>	<b>27</b>
	<b>Total Credit For the Programme</b>	<b>-</b>	<b>-</b>	<b>96</b>

### DISCIPLINE SPECIFIC ELECTIVE COURSES

SEMESTER	COURSE CODE	COURSE TITLE
I	19261DSC15A 19261DSC15B	Strategic Management Organizational Behaviour
II	19261DSC25A 19261DSC25B	Corporate Legal Frame Work Retail Management
III	19261DSC34A 19261DSC34B	Indian Financial System International Marketing
IV	19261DSC44A 19261DSC44B	Information Technology and Computer Applications International Financial Management

### Open Electives

Semester	Open Elective Courses
III	a) 19211OEC-Writing for the media b) 19212OEC-Applicable Mathematics Techniques c) 19213OEC-Bio-medical Instrumentation d) 19214OEC-Green Chemistry e) 19215OEC-Herbal Medicine f) 19220OEC-M-Marketing g) 19280OEC-Counselling Psychology

### M.Com Credit Distribution

Semester	SEC	DSC	OEC	Research	Others	Total
I	16	04	-	01	-	21
II	16	04	-	04	-	24
III	15	04	03	02	-	24
IV	15	04	-	06	02	27
<b>Total</b>	<b>62</b>	<b>16</b>	<b>03</b>	<b>13</b>	<b>02</b>	<b>96</b>

### OUTCOMES:

- Be critical of creative scholars.
- To become effective global citizens.
- Understanding across a broad range of business and commerce disciplines.
- Have knowledge of applications commerce concepts principles.
- Ethical, Social and Professional Understanding.
- Effective communication.

**PRIST UNIVERSITY,  
THANJAVURM.COM**

<b>COURSE TITLE</b>
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Marketing Research and Consumer Behavior
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**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.  
Employability

**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.

**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**

The course helped the students to understand Marketing Research and Consumer Behaviour.

**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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COURSE TITLE
Human Resource Management

**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.  
Employability

**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.

**OUTCOME**

The students provided basic knowledge of human resource management and its importance in the working of Organization.

**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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COURSE TITLE
Services Marketing

**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 service 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 Barrier to international marketing services.

**Employability**

**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.

**OUTCOME**

The course helped the student to identify the different types of services and their marketability.

**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

PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Advanced Cost Management

**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.

**UNIT- IV**

Standard Costing and Variance analysis.

**UNIT- V**

Budgetary Control – Flexible Budgets – Performance Budget – Zero based Budget.  
Employability

**OUTCOME**

The course helped the students to gain expert knowledge in Cost Management.

**REFERENCE BOOKS**

1. A.Murthy & S.Gurusamy – Cost Accounting
2. Charles T.Horgrew and Geoge Foster - Cost Accounting a Managerial Emphasis

3. AsbishK.Bhattacharya –PrinciplesandPracticeofCostAccounting.
4. Dr.Radha–CostAccounting
5. M.Wilson–AccountingforManagement.

## SEMESTER-I

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Elective– I-AstrategicManagement

### 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.  
Skill development

### OUTCOME

The course helped the students to gain knowledge in corporate strategy formulation and SWOT analysis.

### REFERENCE BOOKS

1. Micheal Proter-Competitive Strategy, Competitive advantage.
2. Peter Drucker–Management tasks, responsibilities and Practices.

3. Azharkazmi –BusinessPolicyandStrategicManagement.
4. R.N.Srivastava– InternationalStrategicManagement.
5. P.K.Ghosh–StrategicPlanningandManagement

## SEMESTER-I

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Elective- I–BOrganizationalBehaviour

### 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.

#### Skill development

#### 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.

### OUTCOME

The course helped the student to learn about the Organizational Behaviour in depth.

### REFERENCE BOOKS

6. Micheal Proter-Competitive Strategy, Competitive advantage.

7. PeterDrucker–Managementtasks,responsibilitiesandPractices.
8. Azharkazmi –BusinessPolicyandStrategicManagement.
9. R.N.Srivastava– InternationalStrategicManagement.
10. P.K.Ghosh–StrategicPlanningandManagement

## SEMESTER-II

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Quantitative Techniques For Decisions Making

### 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– Time series..

### 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

The course helped the students to understand important quantitative techniques and their applications in solving business problems.

## REFERENCE BOOKS

1. Quantitative Technique – C.R. Kothari
2. Statistical Methods – S.C. Gupta
3. Statistical Methods – S.P. Gupta
4. Advanced Statistics – D.L. Enclave

## SEMESTER-II

PRIST UNIVERSITY,  
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COURSE TITLE
Total Quality Management

### AIM:

Continual improvement of business operations. It strives to ensure all associated employees work toward the common goals of improving product or service quality, as well as improving the procedures that are in place for production.

### OBJECTIVES

1. To understand the concept of Quality
2. To understand the Implication of Quality on Business
3. To Implement Quality Implementation Programs
4. To have exposure to challenges in Quality Improvement Programs

### 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- Quality manual – Barrier to TQM.

### UNIT-II

Total Quality Management and Leadership: Implementing TQM – Market choices – Meeting customer requirements – Maintaining competitive advantage – Core competence and strategic alliances for ensuring quality – Quality review, recognition and reward – Quality awards: Japanese Deming Award, US Malcolm Baldrige National Quality Award & Indian Golden Peacock National Quality Award.

### UNIT- III

Quality Management Tools for Business Applications: Principles and Applications of Quality Function Development – Failure Mode and Effect Analysis – Taguchi Techniques – Seven old QC Tools – Seven New Management Tools – Statistical Quality Control Techniques (only Theory and no Problems) – Mistake Proofing – Benchmarking – 8D Methodology

### UNIT- IV

Quality Imperatives for Business Improvement: Dimensions of Quality - Reliability Prediction Analysis – Total Productive Maintenance – Costs of Quality – Business Process Reengineering – Process Capability Analysis – Quality Assurance and ISO 9000 Certification – ISO 9001:2000. 40

### UNIT-V

TQM Implementation Strategies: Organizational Structure and Mindset of Individuals –  
Motivational aspects of TQM – Change Management Strategies – Training for TQM – TQM Road  
Map – Quality Improvement Index– Six Sigma concept.  
Skill development

**OUTCOMES:**

1. To realize the importance of significance of quality
2. Manage quality improvement teams
3. Identify requirements of quality improvement programs

**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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<b>COURSE TITLE</b>
Advanced Management Accounting

**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

The courses guided the students in taking vital managerial decisions by using the available tools to the maximum efficiency of the business.

## REFERENCE BOOKS

1. T.S.Raddy & Dr. Hari Prasad Reddy– Management Accounting
2. Sharma & Gupta -Management Accounting
3. S.N.Maheswari-Management Accounting
4. Khan & Jain -Management Accounting
5. R.Ramachandran & R.Srinivasan-Management Accounting

## SEMESTER-II

PRIST UNIVERSITY,  
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COURSE TITLE

Security Analysis and Portfolio Management

## 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



Portfolioanalysis&Management: Portfolioriskandreturn–Diversification-Markowitzmodel  
–Sharpeindexmodel–CAPM–Arbitragepricingtheory.

## OUTCOME

The course helped the students to developing 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, Himalaya Publishing House, Mumbai.
3. Investment Management : L. Natarajan, Margham Publication, Chennai.
4. Investment Management : Bhalla, Tuteja, S. Chand & Sons Publisher, New Delhi.

## SEMESTER-II

PRIST UNIVERSITY,  
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COURSE TITLE
Elective-II–A–Corporate Legal Framework

## 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 Promoter.

## 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 framework – Procedures for obtaining various Environment clearances – functions of Environment Tribunal – Environment Authority – Environment Audit.

## Skill development

## 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.

#### **REFERENCE BOOKS**

1. K.C.MISHRA – Legal and Regulatory Aspects of Insurance.
2. K.C.GARG – Company Law.
3. N.D.KAPOOR – Elements of mercantile laws.
4. N.D.KAPOOR – Legal and Regulatory framework of business.
5. N.K.SENGUPTA – Environment & Management

### **SEMESTER-II**

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Elective-II-B-Retail Management

#### **Elective-II-B-Retail Management**

#### **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.

## Skill development

**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:**

Upon completion of this course, it will enable students to develop decision making skills related to retailing, define retailing, understand what marketing means to business executives and academics, understand the ways that retailers use marketing tools and techniques to interact with their customers.

### **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, South Western Cengage Learning

## **SEMESTER-II**

### **PRIST UNIVERSITY, THANJAVURM.COM**

COURSE TITLE	L	T	C
Research Methodology	4	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 – Rating scale – 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.

**Skill development**

**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.

**OUTCOME**

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

**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

**SEMESTER-III**

**PRIST UNIVERSITY,  
THANJAVURM.COM**

**COURSE TITLE**

Project Planning and Control

**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 over view – The project Identification – Formulation of projects – project planning – stages of Life cycle of a project – system approach of project.

**UNIT- II**

Prefeasibility 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. Employability**

**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.

**OUTCOME**

The course helped the students to learn the issues relating to project management and control.

**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

**SEMESTER-III**

**PRIST UNIVERSITY,  
THANJAVURM.COM**

<b>COURSE TITLE</b>
Advanced Corporate Accounting

**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.

### **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.  
Employability

### **OUTCOME**

The course helped the students to gain expert knowledge in Advanced Corporate Accounting.

### **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**

**PRIST UNIVERSITY,  
THANJAVURM.COM**

**COURSE TITLE**

Investment Management

### **AIM**

To familiarize with the functioning of the Investment Management Systems.

### **OBJECTIVES**

- I. To understand the basic principles and practice of investment management.
- II. To learn about portfolio construction and portfolio management.
- III. To know the role of SEBI in regulating securities market.

### **UNIT- I**

Nature and Scope of Investment Management: Definitions of Investment- Classification of Investment- Investment and Speculation- Popularity of Investments- Alternative Investment – Investments in Gold, Real Estate, Deposits, Mutual Funds, Government Securities- Promissory Notes- shares and debentures .

### **UNIT- II**

Approaches to security analysis –Fundamental analysis –Economic analysis –savings and Investment -Inflation – Technological Development, Infrastructural factors-Political stability –Analysis of Financial statements by important ratios from the Investment Point of view.

### **UNIT- III**

Portfolio Construction –Objectives –Risk Return analysis –Methods of Diversification – Portfolio Revision –Techniques – problems- Approaches in portfolio construction – Traditional approach and Markowitz efficient frontier approach.

### **UNIT- IV**

Portfolio Management, Meaning and Definition – Contributing factors –Principles of Portfolio Management –The role of Portfolio managers in portfolio management.

### **UNIT- V**

The Securities and Exchange Board of India (SEBI) constitution-Objectives–Functions –Powers Organization and Management –Dept of SEBI –SEBI guidelines-permissible securities– Nature of clients–Issue of capital Listing and trading.  
Employability

### **OUTCOME**

Students are now aware of the scope of Investment Management and the role of SEBI in regulating securities market.

### **REFERENCE BOOKS**

1. V.k.Bhalla–Investment Management and Portfolio Management
2. Gordon, J. Alexander, William, F. Sharpe, Seffery V. Baliey–Fundamentals of Investments
3. Prasanna Chandra–Security Analysis and Portfolio Management
4. Avathani V.A– Investment and Securities Management in India
5. Gupta L.C –Return of Equities –The Indian experience.
6. Dr.L.Natarajan– Investment Management.

**SEMESTER-III**

**PRIST UNIVERSITY,  
THANJAVURM.COM**

<b>COURSE TITLE</b>
Elective-III–A-Indian Financial System

### **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. Employability

**OUTCOME**

The Course helped the students to understand the overall functioning of Indian financial system.

**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.

**SEMESTER-III**

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Elective- III – B International Marketing

**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 Internal marketing state Trading in India.

#### **UNIT– IV**

Legal Dimension 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**

The course helped the student to learn the importance of International Marketing and the role of exporting assisting Institutions.

#### **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

**SEMESTER -III**

**PRIST UNIVERSITY,  
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**Course Title**

**Open Elective - Writing for the Media**

**Open Elective - Writing for the Media**

#### **Aim:**

- To equip students to enter into the realm of mass media.

#### **Objectives:**

- To help students 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-Barrier 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. Skill development

**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,	

**SEMESTER-III**

**PRIST UNIVERSITY,  
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<b>Course Title</b>
<b>Open Elective-Applicable Mathematical Techniques</b>

**Open Elective - Applicable Mathematical**

**Techniques Objectives:**

- To 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 get 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

Skill development

**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

**SEMESTER-III**

**PRIST UNIVERSITY,  
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**BIOMEDICAL INSTRUMENTATION**

**Aim:**

- To understand the concepts and application of electronic Instrumentation in the Medical field.

**Objective:**

The students will be able to

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

**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 Blood flow and cardiac output, Respiratory therapy Equipment – Origin of EEG – Action Potentials of the brain – evoked potentials – Placement of electrodes – Recording setup – Analysis of EEG.

**Skill development****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 ultrasound – Physics of ultrasonic waves – medical ultrasound – 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 stimulation.

**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

#### **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. Weibull, Erich A. Pfeiffer, Biomedical Instrumentation and Measurements, PHI, New Delhi. (Unit-III)

#### **Book for Reference**

1. M. Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

**SEMESTER-III**

**PRIST UNIVERSITY,  
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<b>Course Title</b>
<b>Open Elective-GREEN CHEMISTRY</b>

**Objectives:** To learn about the environmental status, public awareness 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 to much attention- Why should chemist 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.

### **Skill development**

## **Unit IV-Green House Effect**

Greenhouse effect and Global Warming – Introduction-How the greenhouse effect is produced  
- Major sources of green house gases - Emissions of CO<sub>2</sub> - 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.Tinnes and
2. New Trends in Green Chemistry– V.K.Ahluwalia and M.Kidwai

**SEMESTER-III**

## 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 markup 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.

Skill development

## UNIT IV

DHTML and Style Sheet – Frames.

## UNIT V

A webpage 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 frontend webpage and connect to the backend 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.



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Course Title
Open Elective-Counseling Psychology

Open Elective-Counseling Psychology

**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. Counseling 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; Bombay; 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, Rinehart And Winston Inc. 1970

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
Income Tax Law and Tax Planning

**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.

**Employability****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**

The course helped the students to know how to compute Income of an individual under various heads and to reduce the tax burden through ideal tax planning schemes.

**REFERENCE BOOKS**

1. Income Tax Act, 1961 as amended upto late.
2. Dr. Vinod K. Singhania – 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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COURSE TITLE
International Business

**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 conflict 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 – Relationship between headquarters and subsidiaries – MNCs in India – The Indianisation of Transnationals..

**OUTCOME**

The course helped the students to learn the importance of Global Business and the functioning of Multinational Corporation.

**REFERENCE BOOKS**

1. Francis Cherunilam–International Business Text and Cases
2. Dr.R.L.Varshney&Bhattacharya– International Marketing Management
3. P.SubbaRao– International Business.

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURM.COM

<b>COURSE TITLE</b>
Co-operation in India and Abroad

#### 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-operatives 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.  
Employability

#### 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.

#### OUTCOME

The course helped the students to learn the basic principles of co-operation and their applications in India and Abroad.

## REFERENCEBOOKS

1. B.S.Mathur –Co-operationinIndia
2. Hajeela –Co-operationinIndiaandAbroad
3. TamilnaduJournalofCo-operation

## SEMESTER-IV

**PRIST UNIVERSITY,  
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COURSE TITLE
Elective- IV – A- Information Technology and Computer Applications

### AIM:

To develop understanding and appreciation of broad nature of application of Information Technology.

### OBJECTIVES:

- I. To know Hardware and Software in Computer system.
- II. To study web Technology, information system including Networking.
- III. To familiarize with Accounting Packages and Computer Assisted Audit Technology

### UNIT-I

Hardware – Types of Computers – Mainframes – Mini Computers, Micro Computers, advantages and limitations – Anatomy Computer-Functions and components of computer.  
Software: System Software – Application Software –  
Other experts specialized systems. (decisions support, artificial intelligence system setc.)

### UNIT-II

Web Technology and Information System: Introduction – Definition of Information System – Decision – making and decision levels – Categories of Information systems – Information systems for competitive advantage – Networking – Classification of Networks – Local Area Network – Metropolitan Area Network – Wide Area Network – Network Topologies – Data Transmission Modes – internet and World Wide Web – Working of W.W.W – TCP/IP – Intranet – Extranet – OSI Models – Technological Infrastructure of Internet.

### UNIT-III

Office Productivity Tools: Word Processing – Electronic Spreadsheets –  
Business Project management and Presentation tools.

### UNIT-IV

Computer Assisted Audit Techniques (CAAT): Introduction to CAAT and usage in accounting/  
Audit.

### UNIT-V

Mobile Commerce: Introduction – Factors that Drive M-Commerce – Differences between E-Commerce and M-Commerce – Growth of M-Commerce in India – Advantages of Mobile Commerce – Technology behind Mobile Commerce – Application of M-Commerce – Types of Mobile Payment – Future of Mobile Commerce

### Skill development

### OUTCOME:

The course helped the students to understand the broad nature of application of Information Technology.

### REFERENCEBOOKS:

- Dr.K.Abirami Devi Dr.M.Alagammai –E-Commerce, Margham Publications

- IT Essentials PC Hardware and Software Labs and Study Guide”, Third Edition – Patrick Regan– Cisco Press – Pearson Education(Chapters1-9, 11-16)
- Dr.P.Rizwan Ahamed- Computer Application in Business with Tally ERP9- Margham Publications.
- S.Arunajatesan–TechnologyinBusiness.

**SEMESTER-IV**

**PRIST UNIVERSITY,  
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<b>COURSE TITLE</b>
IV-B-International Financial Management

**AIM:**

To learn the finance function in the international context.

**OBJECTIVES:**

- To understand the international monetary system
- To study foreign exchange management in India.
- 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. Employability

**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 - Frame work – Project appraisal in the international context – Exchange rate risk and cost of Capital – Joint ventures.

**OUTCOME:**

The course helped the students to learn the finance function in the international context.

**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.

**PRIST UNIVERSITY,**

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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: Prescribed Research

Level 2: Bounded

Research Level 3: Scaffolded

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 M.Com curriculum, the following Research Skill Based Courses are introduced in the curriculum.

<b>Semester</b>	<b>RSBCourses</b>	<b>Credits</b>
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

● <b>Internal Assessment:</b>		<b>40 Marks</b>
● Seminar Report (UG)/Concept Note (PG)	: 5 X 4 = 20 Marks	
● Seminar Review Presentation	: 10 Marks	
● Literature Survey	: 10 Marks	
● <b>Semester Examination</b>	:	<b>60</b>
<b>Marks</b>		
(Essay type Questions set by the concerned resource persons)		

### Blueprint for assessment of student's performance in Socio Technical Project

● <b>Continuous Internal Assessment through Reviews:</b>		<b>40 Marks</b>
● Review I	: 10 Marks	
● Review II	: 10 Marks	
● Review III	: 20 Marks	
● <b>Evaluation of Socio Technical Practicum Final Report:</b>		<b>40 Marks</b>
● <b>Viva-Voce Examination:</b>		<b>20 Marks</b>
● <b>Total:</b>		<b>100 Marks</b>

### Blueprint for assessment of student's performance in Research Methodology

<b>Courses Continuous Internal Assessment:</b>		<b>20 Marks</b>
● Research Tools (Lab):		10 Marks
	● Tutorial:	10 Marks
<b>Model Paper Writing:</b>		<b>40 Marks</b>
● Abstract:		5 Marks
● Introduction:		10 Marks
● Discussion:		10 Marks
● Review of Literature:		5 Marks
● Presentation:		10 Marks
<b>Semester Examination:</b>		<b>40 Marks</b>
<b>Total:</b>		<b>100 Marks</b>





**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMILNADU

**DEPARTMENT OF COMMERCE-  
COMPUTER APPLICATIONS**

**B.com-  
CASYLLAB  
US**

**(REGULATION 2019)**

## **B.COM– CAPROGRAMME**

Computer Application is a professional course among the various art subjects. Computer Application 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 possess a 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**



**B.Com-CA (Computer Applications)**

**COURSESTRUCTURE**

**SEMESTER -I**

COURSECODE	COURSE TITLE	L	T	P	C
19110AEC11/19111AEC11/ 19132AEC11/19135AEC11	Tamil-I/Advanced English -I/ /Hindi- I/French-I	4	0	0	2
19111AEC12	English I	4	0	0	2
19198SEC 13	Financial Accounting	5	0	0	5
19198SEC 14	Business Management	4	0	0	3
19198AEC15	Information Technology	4	0	0	4
19198AEC16	Operating System	4	0	0	4
191--SEC01--	Skill Based Elective-I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>TOTAL</b>	<b>26</b>	<b>0</b>	<b>3</b>	<b>23</b>

**SEMESTER -II**

COURSECODE	COURSE TITLE	L	T	P	C
19110AEC21/19111AEC21/ 19132AEC21/19135AEC21	Tamil -II / Advanced English - II/ /Hindi- II/French-II	4	0	0	2
19111AEC22	English II	4	0	0	2
19198SEC 23	Advertising and Salesmanship	5	0	0	4
19198SEC 24	Business Law	4	0	0	4
19198AEC25	Programming in C	6	0	0	6
19198AEC26L	Programming in C Lab	0	0	3	2
19198RLS27	Research Led seminar	0	0	0	1
191SEC02--	Skill Based Elective-II	0	0	2	1
19111SEC02L	Communicative English Lab- II	0	0	2	1
	<b>TOTAL</b>	<b>23</b>	<b>0</b>	<b>7</b>	<b>23</b>

	EMPLOYABILITY
	ENTREPRENEURSHIP
	SKILL DEVELOPMENT

### SEMESTER-III

COURSECODE	COURSETITLE	L	T	P	C
19110AEC31/19111AEC31/ 19132AEC31/19135AEC31	Tamil-III/AdvancedEnglish-III/ /Hindi- III/French-III	4	0	0	2
19111AEC32	English- III	4	0	0	2
19198SEC33	CostAccounting	5	0	0	5
19198SEC34	BankingTheoryLawandPractice	4	0	0	3
19198AEC35	ProgramminginC++	6	0	0	6
19198AEC 36L	ProgramminginC++lab	0	0	3	2
19198RMC37	ResearchMethodology	3	0	0	3
191SEC03--	SkillBasedElective-III	0	0	2	1
19111SEC03L	CommunicativeEnglishLab-III	0	0	2	1
	<b>TOTAL</b>	<b>26</b>	<b>0</b>	<b>7</b>	<b>25</b>

### SEMESTER-IV

COURSECODE	COURSETITLE	L	T	P	C
19110AEC41/19111AEC41/ 19132AEC41/19135AEC41	Tamil-I/AdvancedEnglish -I/ /Hindi- I/French-I	4	0	0	2
19111AEC42	EnglishIV	4	0	0	2
19198SEC43	Auditing	5	0	0	5
19198SEC44	BusinessStatistics	4	0	0	5
19198AEC45	VisualBasicProgramming	6	0	0	6
19198AEC46L	VisualBasicProgrammingLab	0	0	3	2
191SEC04--	SkillBasedElective-IV	0	0	2	1
19111SEC04L	CommunicativeEnglishLab -IV	0	0	1	1
191ENVTSTU	EnvironmentalStudies	1	0	0	1
	<b>TOTAL</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>25</b>

### SEMESTER -V

COURSECODE	COURSETITLE	L	T	P	C
19198SEC51	CorporateAccounting	5	0	0	5
19198SEC52	BusinessEconomics	5	0	0	5
19198SEC53	FinancialManagement	5	0	0	5
19198SEC54	SoftwareEngineering	4	0	0	4
19198DSC55_	DisciplineSpecific Elective-I	4	1	0	4
19198BRC56	ParticipationinBounded Research	0	0	0	2
191SEC05--	SkillBasedElective-V	0	0	2	1
19111SEC05L	CommunicativeEnglishlabV	0	0	2	1
	<b>TOTAL</b>	<b>23</b>	<b>1</b>	<b>4</b>	<b>27</b>

	EMPLOYABILITY
	ENTREPRENRURSHIP
	SKILL DEVELOPMENT

### SEMESTER–VI

COURSECODE	COURSETITLE	L	T	P	C
19198SEC61	ManagementAccounting	5	1	0	5
19198SEC62	IncomeTaxLawandPractice	5	0	0	5
19198SEC63	DatabaseManagementSystem	4	0	0	4
19198DSC64	DisciplineSpecificElective- II	4	0	0	4
191OEC65	OpenElective - I	4	0	0	2
19198PRW66	ProjectWork	2	0	0	4
191SEC06--	Skill Based Elective– VI	0	0	2	1
19111SEC06L	CommunicativeEnglishlab -VI	0	0	2	1
19161EXACT	ExtensionActivities	0	0	0	1
19261PEE	ProgramExitExamination	0	0	0	2
	Total	24	1	4	29
	TotalCreditsoftheProgramme				152

### DISCIPLINESPECIFICELECTIVE

SEMESTER	ELECTIVE NO	COURSECODE	COURSETITLE
V	I	19198DSC55A 19198DSC55B	Management InformationSystem InvestmentManagement
VI	II	19198DSC64A 19198DSC64B	E-Commerce WebDesigning

### OPENELECTIVE

SEMESTER	OPEN ELECTIVE NO	COURSE CODE	COURSETITLE
VI	A	19111OEC	Journalism
	B	19112OEC	DevelopmentofMathematicalSkillsI
	C	19113OEC	nstrumentation
	D	19114OEC	Food and
	E	19117OEC	AdulterationMushroom
	F	19120OEC	TechnologyWebTechn
	G	19122OEC	ology E-Commerceanditsapplication

### SKILLBASEDELECTIVE

SEMESTER	SKILL BASEDELECTIVE COURSE NO	COURSECODE	COURSE TITLE
I	I	19120SEC01AL/ 191--SEC01B	Package lab-I/ Soft Skills- I
II	II	19120SEC02AL/ 191--SEC02B	Package lab-II/ SoftSkills-II
III	III	19120SEC03AL/ 191--SEC03B	Package lab-III/ SoftSkills-III
IV	IV	19120SEC04AL/ 191--SEC04B	Package Lab-IV/ SoftSkills-IV
V	V	19120SEC05AL/ 191--SEC05B	Package lab-V/ SoftSkills-V
VI	VI	19120SEC06AL/ 191--SEC06B	Package Lab -VI/ SoftSkills-VI

### B.Com– CA Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	12	10	-	-	-	01	23
II	12	10	-	-	01	-	23
III	12	10	-	-	03	-	25
IV	12	12	-	-	-	01	25
V	-	21	04	-	02	-	27
VI	-	16	04	02	04	03	29
<b>Total</b>	<b>48</b>	<b>79</b>	<b>08</b>	<b>02</b>	<b>10</b>	<b>05</b>	<b>152</b>

#### OUTCOMES:

	EMPLOYABILITY
	ENTREPRENEURSHIP
	SKILL DEVELOPMENT

- Be critical of creative scholars.
- Understanding across a broad range of business and commerce disciplines.
- Have knowledge of applications of commerce concepts and principles.
- Ethical, social and professional understanding.
- Effective communication.



- 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 . நாடகக்கல் கவிஞர் - தமிழ் தேன், தமிழ் வளர்ச்சி சபதம் செய்வோம் , 40 அடிகள்
7. ந.பிச்சமுர்த்தி - 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

**SEMESTER-I**

**PRIST UNIVERSITY,  
THANJAVURB.COM- CA**

CourseCode	CourseTitle	L	T	P	C
19111AEC11	AdvancedEnglish-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 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 –**

Foreign words and phrases  
British and American Vocabulary

**II UNIT –**

Speeches of famous people:  
Mahatma Gandhi- Abraham Lincoln- Swami Vivekananda- John F. Kennedy

**III UNIT –**

Editing  
Proofreading

**IV UNIT –**

Comparison and contrast  
Cause and effect

**V**

**References:**

- English Grammar -  
Wren and  
Martin English Grammar and Composition -  
Radhakrishna Pillai  
Essentials of Business Communication - Rajendra Pal & J.S Korlahalli  
Su  
Itan Chand & Sons English for writers  
and translators -  
Robin Macpherson  
Technical Communication - Meenakshi Sharma &  
Sangeetha Sharma The World's Great Speeches

**SEMESTER-I****PRIST UNIVERSITY,  
THANJAVURB.COM-  
CA**

<b>Coursecode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC12	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

**PRISTUNIVERSITY,THANJAVUR**  
**B.COM–CA**

COURSECODE	COURSE TITLE	L	T	P	C
19198SEC 13	FinancialAccounting	5	0	0	5

**AIM:**

- This programme is designed to provide high quality education in theoretical and practical knowledge and skills 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 — book keeping — Journal — Subsidiary books — Ledger Trail Balance.

**UNIT -III**

Statement of accounts — Manufacturing account—Trading account — Profit and Loss account.

**Employability****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.

**OUTCOME:** 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—Kaliyani Publisher.
2. Principles of Accounting— Finney H. A. Miller H.E., PHLAuditing - Tandon

**PRISTUNIVERSITY, THANJAVUR**  
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<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198SEC 14	BusinessManagement	4	0	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 rules— 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:** This course should help the students taking better decision making process.

**Reference Books**

1. **L.M.Prasad-Principles of Management**
2. **Dinker Pagare-Business Organization and Management**
3. **Dr.C.B.Gupta-Business Management**

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM-CA**

COURSECODE	COURSE TITLE	L	T	P	C
19198AEC15	Information Technology	4	0	0	4

**AIM**

- To provide opportunity for the study of modern methods of information processing and its applications

**OBJECTIVES**

- Show 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.

Employability

**UNIT-4:**

General Concept of OOPS  
(Object oriented programming) Operating Systems: Concept and function of Operating system.

**UNIT-5:**

Batch processing, Multiprogramming, Realtime, timesharing, distributed system.

**OUTCOME:** This course will be guided to the student business technologies around the world.

**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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<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198AEC16	OperatingSystem	4	0	0	4

**AIM:**

- Provide proficiency skill of operating system to the target students

**OBJECTIVES**

1. To learn the fundamentals of Operating Systems.
2. To learn the mechanisms of OS to handle processes and threads and their communication
3. 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.

**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:** Students will be able to: Analyze the structure of OS and basic architectural components involved in OS design

**Text Book:**

1. Operating systems — E. Madnick and John J. Donovan — Tata McGraw Hill
2. Operating Systems (Concepts and Design) Milan Milenkovic - McGraw Hill International Edition

**PRISTUNIVERSITY,THANJAVURB.COM**  
**PackageLab-**

**1MS-WORD**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC01A	PackagesLab-I	0	0	2	1

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



CourseCode	CourseTitle	L	T	P	C
19160SEC01B	SOFTSKILL–IEffective Communication	0	0	3	2

### Part-IEffectiveCommunication

#### UNIT I                      EffectivecommunicationI

**OralCommunication:** Listening skills -Speaking skills (what to say and how to say it) – Gender neutral Language -Conflict, criticism, anger-Telephone skills.

#### UNIT II                      EffectivecommunicationII

**WrittenCommunication:** Mechanics of writing, letters, notes, and reports - Resume preparation Faxes - Web sites - Email and Memos.

**NonverbalCommunication:** Behavior, Body language and Attitude.

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CourseCode	CourseTitle	L	T	P	C
19111SEC01L	CommunicativeEnglishLab-I	0	0	1	1

**Aim:**

- To acquaint with the basic grammar and develop language skills

**Objective:**

- To know English grammar and all the concomitant linguistic items
- To learn about the auxiliary and the models
- To understand the types of sentences and its patterns
- To enrich vocabulary
- To familiarize the features, process, forms and barriers of communication
- To enhance listening skill

**Outcome:**

- Understand grammar
- Develop listening skill

**UNIT –I**

Parts of speech

**UNIT – II**

Kind of Sentences, Patterns of sentences

**UNIT – III**

Auxiliaries, Modals  
Skill development

**UNIT –IV**

Communication-Characteristics-Process-Forms-Barriers-Types

**UNIT-V**

Listening-benefits-types-good listener-active and passive listening-Effective listening  
Lab Note-1. Word Mentor - Level I Words and their meaning-Root and usage-Fill in the blanks-Synonyms-  
Antonyms-Match the Words, Listening activity from Globarena Software 2. Vocabulary diary  
Viva-Listening activity  
Exam components-Theory-50+MCQ online exam-vocabulary-20+Viva-15+Labnote-15=100

**References:-**

English Grammar - Wren and  
Martin English Grammar and Composition -  
Radhakrishna Pillai  
Technical Communication - Meenakshi Sharma & Sangeetha Sharma  
Essentials of Business Communication - Rajendra Pal & J.S. Korlahalli Sultan Chand & Sons

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<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
191INDCONS	Indian Constitution	1	0	0	1

**AIM**

To learn the fundamental and features of Indian Constitution.

**OBJECTIVES**

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

**Unit— 1: 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—2: 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—3: Directive Principles of State Policy**

Socialistic Principles - Gandhian Principles — Liberal and General Principles — Differences between Fundamental Rights and Directive Principles

**Unit—4: The Union Executive, Union Parliament and Supreme Court**

Powers and positions of the President — Qualification — Method of Election of Presidents and Vice President — Prime Minister — Rajya Sabha — The Supreme Court — High Court — Functions and position of Supreme Court and High Court.

**Unit—5: 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.

**OUTCOME:** This course will be helped to understand the students about concept of Indian constitution

**References:**

1. Palekar.S., *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

- 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. திரிகூடராசப்ப 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)

**PRIST UNIVERSITY,  
THANJAVURB.COM-  
CA**

CourseCode	CourseTitle	L	T	P	C
19111AEC21	AdvancedEnglish-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 –**

os

**II UNIT –**

Itinerary  
Checklist

**III UNIT –**

Invitation  
Circular

**IV UNIT –**

Instruction  
Recommendations

**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 Workbook - I & II - Jewelcy Jawahar

**PRIST UNIVERSITY, THANJAVURB.COM-  
CA**

CourseCode	CourseTitle	L	T	P	C
19111AEC22	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

-Gowri Sivaraman Emerald Publishers

COURSECODE	COURSETITLE	L	T	P	C
19198SEC 23	AdvertisingandSalesmanship	5	0	0	4

**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

**Employability**

**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

**OUTCOME:**

The course helped the students to understand the importance of Advertising and Salesmanship in a highly competitive business world.

**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. Chuna Walla -- Advertising Theory and Practice
6. Rathor — Advertising Management

**PRIST UNIVERSITY, THANJAVUR**  
**B.COM-CA**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198SEC 24	Business Law	4	0	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

**Employability****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

**OUTCOME:** Students will demonstrate competent knowledge and understanding of substantive and, to the extent applicable, procedural law related to corporations

**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.



**PRISTUNIVERSITY, THANJAVUR**  
**B.COM-CA**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198AEC25	Programming in C	6	0	0	6

**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 array 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—Bit wise Operations-Macros-Preprocessing.

**TEXT BOOK:** “Programming in C” ~ E. Balagurusamy — Tata McGraw-Hill

**Publications OUTCOMES:** After the completion of this course, the students will be able to develop applications.  
**Book for Reference:**

1. “Programming with C” — Byron S. Gottfried — Schaum’s outline series — Tata McGraw-Hill publications.
2. “Let us C” ~ Yeswantkanetkar—BPB Publications.

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM-CA**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198AEC26L	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:**

Understanding a functional hierarchical code organization. Ability to define and manage data structures based on problem subject domain.

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<b>Course Code</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC02A	PackagesLab-II	0	0	2	1

**MS-EXCEL**

1. Prepare the addressing methods in excel
2. Describe the type of function
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 preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare an Inventory Preparation
8. Prepare an Electricity Bill Preparation

**SEMESTER-II**

**PRISTUNIVERSITY, THANJAVUR**

**B.COM-CA**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC02 B	SOFTSKILL–II-SelfDevelopment	0	0	3	2

**Part-II Self Development**

**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

**PRIST UNIVERSITY, THANJAVURB.COM-**

**CA**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111SEC02L	CommunicativeEnglishLab-II	0	0	2	1

**Aim:**

- Toacquaintwiththebasicgrammar anddeveloplanguageskills

**Objective:**

- Tounderstandthedifferent tensesanduseitinsentences
- Toformsentences
- Toknowsubjectverb agreement
- Toenrich vocabulary
- Toreadandcomprehendthecontext

**UNIT-1** Tenses-Simple,Perfect

**UNIT -II** Tenses-Continuous,Perfectcontinuous

**UNIT -III** Formingsentences-positive,negativeandquestions

**UNIT -IV** Concord

**UNIT -V** Reading-benefits-purpose-techniques-types-Effectivereading  
Lab Note-1. Word Mentor - Level II Words and their meaning-Root and usage-Fill in the blanks-  
Synonyms-Antonyms-Match the Words, reading activity from Globarena Software 2.  
NewspaperArticlenotebook

Viva-Readingactivity

ExamComponents-Theory-50+MCQonlineexam-20+Viva-15+Lab note-15=100

**Outcome:**

- Understandgrammar
- Developreadingskills

**References:-**

1. EnglishGrammar -Wren andMartin
2. EnglishGrammarandComposition -RadhakrishnaPillai
3. TechnicalCommunication -MeenakshiSharma &SangeethaSharma
4. EssentialsofBusinessCommunication-Rajendra Pal&J.SKorlahalliSultanChand&Sons

- 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 . நளவேண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

- 9 . காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

## PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19111AEC31	AdvancedEnglish-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.  
Balasubramanian

## PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19111AEC32	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



## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19161SEC33	CostAccounting	3	1	0	5

#### AIM

To ascertain the costs 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 – Re Apportionment and Absorption.  
Employability

#### 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.

#### OUTCOME:

The students gained knowledge on cost ascertainment and cost control.

#### 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.

## PRIST UNIVERSITY, THANJAVUR.B.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19161SEC34	BankingTheoryLaw andPractice	4	0	0	4

**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:**

The course helped the students to understand the basic important functions and principles and practices of Banking Theory Law in day to day business.

**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

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198AEC35	ProgramminginC++	6	0	0	6

#### AIM:

Implementseveralprograms inlanguages otherthantheoneemphasizedinthecore 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.

#### OUTCOMES:

Apply C++ features to program design and implementation.

#### TEXTBOOK:

"Object oriented programming with C++". E. Balagurusamy , Tata McGraw . Hill publishing ltd., New Delhi, 1995.

#### REFERENCE BOOKS:

1. C++ The complete reference- Herbert Schildt, 3rd edition, Tata McGraw Hill Pub- Ltd., 1999.
2. Let us C++- Yeswant Kanetkar- BPB Publications, 1999.

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198AEC 36L	ProgramminginC++lab	0	0	3	2

#### AIM:

UseC++todemonstratepracticalexperiencein developingobject-oriented solutions

#### OBJECTIVES:

- Analyseaproblemdescriptionanddesignandbuildobject-orientedsoftwareusinggoodcodingpracticesand techniques
  - designandimplement programsusingC++
1. Write C++ program using a class to represent a bank account with data members- name of depositor,accountnumber,type ofaccount,balanceandmemberfunctions- depositamount,withdrawamount,show Name andbalance. Check the programwithyour own data.
  2. Design anabstractbaseclass"Shapes"andderivethreeclasses "Rectangle", "Circle"and"Triangle".Develop polymorphic functions "Circumference" and "Compute-Area" to calculate thecircumference and area of these objects and display it. Develop a main program to create each oftheseand applythesepolymorphicfunctions.
  2. WriteC++programsfor implementinginheritance.
  3. WriteaC++program toillustrateinlinefunctions.
  4. WriteaC++program usingfriend operatorfunction.

#### SkillDevelopment

5. WriteaC++program toillustratevirtual baseclass,virtualfunctionandabstractclass.
6. Writeaprogram whichreads a text from afileand the displaythefollowinginformation.
7. NumberofLines
8. Numberofwords.
9. Numberofcharacters.
10. Stringsshouldbeleft-justifiedandnumbers shouldberight-justifiedin\_ asuitablefieldwidth.
11. WriteaC++program toimplement fileconcept: Createafileandstoresometext, displaythecontentofthe filewith line numbers.
12. FileProcessing:Marksheetpreparation.
13. FileProcessing: Inventorypreparation.

#### OUTCOME:

Thecourseistobuildstudents'conceptualandpracticalskillsinbuildingsoftwareprojectsintheC++programminglanguage to reasonablyadvanced level.

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVUR B.COM-CA

COURSECODE	COURSE TITLE	L	T	P	C
19198RMC37	Research Methodology	3	0	0	3

### GENERAL RESEARCH METHODOLOGY

#### 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
- 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–Primarysourcesofjournalsandpatents–Secondarysources–

Listingof titles–Abstracts – Reviews–General treatises – Monographs.

#### **Skill Development**

### **UNIT IV: Database Survey**

Databasesearch–NIST–MSDS–PubMed–Scopus – Science citation index–  
Informationaboutaspecific search.

### **UNIT -V**

#### **Business Research**

Research in Management: An Introduction– Definition, meaning and nature – Scope and objects of Research. Types of Research-Research Design–Defining Research Problem and Formulation of Hypothesis – Experimental Designs.-Sampling and types of sampling-Research Process – Steps in the process of Research, Data Collection and Measurement: Sources of Secondary data – Methods of Primary data collection – Questionnaire construction.-Data presentation and Analysis – Data Processing – Methods of Statistical analysis and interpretation of Data .

### SEMESTER-III

#### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19120SEC03A	PackagesLab-III	0	0	2	1

#### POWERPOINT

1. Create a slideshow 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 slideshow presentation for a science exhibition
  - a. Create Non-bulleted and bulleted text
  - b. Apply appropriate text attributes
3. Create a slideshow 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 slideshow 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 slideshow presentation for a shop advertisement to be open shortly
6. Create a slideshow 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 slideshow presentation for tourists places
8. Create a slide for a calendar using appropriate text attributes and insert an object from a bitmap file

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19160SEC03B	SOFTSKILL- III InterpersonalRelationsandSocialResponsibilities	0	0	3	2

#### Part-IIIInterpersonalRelationsandSocialResponsibilities

##### UNITI:Interpersonal Relations

Nature of groups and teams, Team effectiveness, Group discussions and decision making, EmotionalIntelligence(EI) and Emotional Quotients (EQ), and its effect on team, Cross Cultural Aspects, Interdependence,Peer Reviews.

##### UNITII:EthicsandSocialResponsibilities

Personal professional and corporate ethics, Ethical dilemma, Corporate social responsibilities: Greencomputing,Social accounting, Auditing, Civic sense.  
Skilldevelopment



## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19111SEC03L	CommunicativeEnglishLab-III	0	0	2	1

#### Aim:

- To acquaint with the basic grammar and develop language skills

#### Objective:

- To change a sentence from active to passive and vice versa
- To make sentences
- To write a letter
- To improve vocabulary
- To enhance speaking skills
- To enrich writing skills

#### Outcome:

- Understand grammar
- Develop speaking and writing skills

#### UNIT –1

Active and Passive

#### UNIT –II

Developing the hints

#### UNIT –III

Letter writing

#### UNIT –IV

Speaking-benefits-features of a good speaker-Tip for improving speech-types

#### UNIT –V

Writing-benefits-types-tips for improving writing

**Lab Note-1.** Anagrams, Word Traps, Stinging Words, letter writing from Globarena Software, Self-introduction, 2. Picture writing note book

**Viva-**Self introduction, Picture talk

**Exam components-** Theory-50+MCQ online exam -20+ Viva-15+Labnote-10=100

#### References:-

English Grammar

Martin English Grammar and Composition

Technical Communication

Business Communication

-Wren and

-Radhakrishna Pillai

-Meenakshi Sharma & Sangeetha Sharma Essential of

-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons

- பிரிஸ்ட் நிகர்நிலை பல்கலைக்கழகம் வல்லம் ,தஞ்சாவூர்  
பாட குறியீடு : 20110AET41

தமிழ்

நான்காம் பருவம்

முதலாம் ஆண்டு (BA , BSC , B.COM , BBA )

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

**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 - 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 : 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.ஊக்கமுடைமை 3.மழவு

**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 , பதினெண்கீழ்க்கணக்கு நூல்கள்.

**SEMESTER-IV**  
**PRIST UNIVERSITY, THANJAVURB.COM-CA**

CourseCode	CourseTitle	L	T	P	C
19111SEC41	AdvancedEnglish-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 Workbook - I & II - Jewelcy Jawahar

**SEMESTER-IV**  
**PRIST UNIVERSITY, THANJAVURB.COM**

CourseCode	CourseTitle	L	T	P	C
19111AEC42	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 Tempe  
 st

**References:-**

English for Enrichment -  
 .Devaraj Emerald Publishers Selected Scenes from Shakespeare Book I & II - Emerald  
 Publishers

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19198SEC43	Auditing	5	0	0	5

**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.

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)

#### OUTCOMES:

This course helped the students that who to calculate financial activities Refer

#### ence Books

1. B.N.Tandon— 'A Practical] Hand Book of Auditing'
2. Dinkar Pagare— 'Principles and Practice of Auditing'
3. R.G.Saxena— 'Principles and Practice of Auditing'
4. Rupram Gupta— Auditing.
5. C.R.M. Depuala— The Principles of Auditing

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM-CA**

CourseCode	CourseTitle	L	T	P	C
19198SEC44	BusinessStatistics	4	0	0	5

**Aim:**

- Provide a foundation and motivation for exposure to statistical ideas subsequent to the course.

**Objective:**

- Motivate students 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 -- classification of data — frequency distribution — graphs and diagrams.

**UNIT -II**

Measures of central tendency — arithmetic, geometric and harmonic mean - characteristics — measures of dispersion — range — mean deviation and standard deviation — skewness — correlation -- regression.

**UNIT -III**

Time series — secular trend — index numbers — uses — cost of living index — index numbers of wholesale prices.

**EMPLOYABILITY****UNIT -IV**

Quantitative analysis in the practice of management — models and their development — matrices — addition — multiplication — transpose — inverse — introduction to linear programming — concepts of optimization — solving LP using graphical and simplex method — transportation — assignment — (only simple problems).

**UNIT -V**

Simulation - Queuing model (M/M/I) — replacement decisions.

**OUTCOMES:** The ability to apply fundamental concepts in exploratory data analysis. Distinguish between different types of data

**References:**

1. V.K.Srinivastave, Gv.Senoy, S.C.Sharma, Quantitative techniques for managerial decision making.
2. N.D.Vohra Quantitative techniques in management.
3. Sharma, Operation research, theory and applications.
4. Gupta S.P. statistics methods.
5. Elhance D.N, Fundamentals of statistics.

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**

CourseCode	CourseTitle	L	T	P	C
19198AEC45	VisualBasicProgramming	6	0	0	6

**Aim:**

- Students must know about the Core programming of visual basic

**Objective: students will understand**

- The ability of the system to adjust to the changing requirement of user.
- The ability of the system to be able to withstand long period 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-ScrollBars-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 DataBase Connectivity.

**OUTCOMES:** This course will be helped the students understanding on database operations Text Books:

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.

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19198AEC46L	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 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 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: Visual Basic provides a huge number of graphic tools that students can be used to solve all sorts of problems.**



## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19160SEC04B	SOFTSKILL-IV EtiquetteAnd InterviewingSkills	0	0	3	2

#### PART-IVEtiquetteandInterviewingSkills

##### UNITI Corporate

Corporategroomingand dressing,Etiquettesinsocialaswellasofficesettings,EmailEtiquettes, Telephone Etiquettes, Contemporary issues in corporate life: diversity,Attrition,Work lifebalance, Hygieneand health.

##### UNITII InterviewingSkills

Researchingthejob-Researchingthecompany-Questionstoresearchthecompany-Informationalinterviews-Behavioral interviewing- Types of interview (Individual interviews, panel interviews, serialinterviews, video interviews and teleconferencing) references-selling yourself-dressing for success-bodylanguage-stress reduction-Handlingillegal questions.

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19111SEC04L	CommunicativeEnglishLab-IV	0	0	1	1

#### Aim:

- To develop communicative skills

#### Objective:

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To improve presentation skill
- To enrich vocabulary

#### Outcome:

- Understand grammar
- Develop language and presentation skills

#### UNIT –I

Direct and Indirect

#### UNIT –II

Comprehension

#### UNIT –III

Conversation

#### UNIT –IV

Descriptive Writing

#### UNIT –V

Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception

**Lab Note**-Confusing Words, Word families, Non-

English words, Presentation skills, Oral presentation, Conversation from Global arena software

**Viva**-Presenting a topic

**Exam components**-Theory-50+MCQ online exam-20+Viva-15+Lab note-15=100

#### References:-

English Grammar

-Wren and

Martin English Grammar and Composition

-

Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma & Sangeetha

Sharma Essentials of Business Communication-Rajendra Pal & J.S Korlahalli Sultan

Chand & Sons Soft skills

-D.Jayacandran D.J Publishers

## GLOBAL ENAS SOFTWARE

### Objective:

- To hone LSRW skills through emerging techniques
- To comprehend meaning from text to words
- To cultivate the habit of reading
- To make the students proficient in pronunciation
- To improve the listening skill

### Outcome:

- Develop LSRW skills
- Phonetics Listen in

gComprehension

Reading

Comprehension Word Ment

or-Level I & II

- Words and their meaning
- Root and usage
- Fill in the blanks
- Synonyms
- Antonyms
- Match the Words

### Lab Note:

Word Mentor - Level I &  
II Listening  
Comprehension Reading  
Comprehension Newspaper  
Article

### Viva:

ListeningComprehensionReadingCom  
prehension

**ExamComponents**

Theoryexam	:	50
Labnote	:	10
ListeningComprehension:		20
ReadingComprehension:		20
Total:		100

**Theoryexampattern:**

SectionA	$10*2=20$
SectionB	
	$2*15=30$
Total	$=50$

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
191ENVSTU	Environmentalstudies	1	0	0	1

#### AIM:

To help the students to acquire knowledge of pollution and environmental degradation

#### OBJECTIVES: Students can help and care

- Social groups and individuals to acquire a set of values for environmental protection.
- An opportunity to be actively involved at all levels in environmental decision making.

#### 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 – Greenland 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- Threat to biodiversity – Endangered and endemic species of India – Conservation of biodiversity.

Skill development

#### 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, rainwater harvesting, watershed management – Environmental Ethics – Climate change greenhouse effect and global warming – Ozone depletion – Wasteland reclamation – Consumerism and waste products – Environmental Legislation – Issues involved in enforcement of environmental legislation – Public awareness – Human population and the environment.

#### OUTCOME:

**This course created awareness about environment ecosystem TE**

#### XTBOOK:

‘ENVIRONMENTAL STUDIES’, K. Kumarasamy, A. Alagappa Moses, M. vasanthy.

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19198SEC51	CorporateAccounting	5	0	0	5

#### AIM

To train the student to grasp the principles and practice of corporate accounting

#### OBJECTIVES

- I. To get broad picture of inflation and human resources accounting.
- II. To gain expert knowledge in advanced corporate accounting on Banking, Insurance and Electricity services.
- III. To learn Holding companies accounting.

#### UNIT – I

Holding Companies-consolidated Balance Sheet with single subsidiary

#### UNIT – II

Accounts of Insurance Companies

#### UNIT – III

Accounts of Insurance Companies  
Employability

#### UNIT – IV

Double Accounts System-Electricity-Repairs and renewals

#### UNIT – V

Principles of Government Accounting–Human Resource Accounting and Inflation Accounting.

#### OUTCOME

The course helped the student to gain expert knowledge on advanced corporate accounting.

#### REFERENCE BOOKS

1. R.L.Gupta and M.Radhaswamy – Advanced accountancy vol– II
2. S.P.Jain K.L. Narang – Advanced Accountancy Vol –II
3. T.S. Reddy and Dr.A.Murthy – Corporate Accounting Vol –II
4. S.P.Iyenger – Advanced accountancy–Vol –II

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198SEC52	BusinessEconomics	5	0	0	5

**AIM:** Students will learn how markets and other governance structures organize core economic activities

**OBJECTIVE:** Students will be able to

- 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—Law of Return—Cost of Production—curve—Scale of Production—Isoquant curve-Economies of Large scale production.

#### EMPLOYABILITY

#### Unit-IV

Cost concepts-Different costs-Long and short run cost curves—Relationship between costs—Break even analysis

#### Unit-V

Market Structure—Firm—Equilibrium Firm and Industry—Optimum Firm—Pricing—Pricing under Perfect competition— Monopoly— Duopoly— Oligopoly

**OUTCOME:** Students learned through this course about economic structure, policy and application Reference Books:

ooks:

1. K.P.M.Sundaram & N.Sundaram - Business Economics
2. S., Sankaran- Business Economics
3. P.N.Reddy & Appanaiyah—Business Economic

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198SEC53	FinancialManagement	5	0	0	5

#### AIM:

Optimum funds utilization. Once the funds are procured, they should be utilized in maximum possible way at least cost.

#### OBJECTIVE:

1. To ensure regular and adequate supply of funds to the concern.
2. 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

#### Employability

#### 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: This course guided the students various relationship among the financial movements**  
**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—Financial of Management



## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198SEC54	SoftwareEngineering	4	0	0	4

**AIM:** To produce programmersequippedwith an understandingoffundamentalcomputationalconceptsunderlyingmost programminglanguages

**OBJECTIVE:Studentsto** knowabout:

- techniques forsolvingproblems
- basiccomputationalconceptsandelementarydata structures
- theedit-compile-link-run cyclefromauserpointofview

#### UNITI

Introduction — definition-size factors- quality and productivity factors- managerial issues. Planning - softwareproject—introduction—definingtheproblem-developingastrategy-planningthedevelopmentprocess-planningan organizational structure.

#### UNITII

Softwarecostestimation—costfactors—costestimationtechniques—staffing —levelestimation — estimatingsoftwaremaintenancecosts.Softwarerequirementsdefinition— softwarerequirements specificationtechniques— languages andprocessors forrequirements.

#### UNITIII

Software design — fundamental design concepts — modules and modulation criteria — designnotations—designtechniques—detaildesignconsiderations—realtimeanddistributedsystemdesign — testplans—milestoneswalkthroughsandinspections—designguidelines.

#### UNIT -IV

Implementationissues—structuredcodingtechniques—codingstyle—standardsandguidelines — documentationguidelines —data abstraction—exceptionhandling—concurrencymechanisms.

#### UNITV

Verification and validation techniques — quality assurance — walkthrough and inspections — staticanalysis — symbolic executions — unit testing and debugging — system testing — formal verification.Softwaremaintenances—enhancingmaintainabilityduringdevelopment—managerialaspects— configurationmanagement— sourcecodemetrics.

#### OUTCOMES:

**Thestudent**would understandtheproblem;plans;top-downdesign/stepwiserefinement;recognitionof similarities between problems leadingto adaptation and reuse.

#### TextBook

SoftwareEngineeringConcepts“—Richard fairlyTMH

#### ReferenceBook:

“SoftwareEngineering”- RogerS.Pressman,5thedition2001

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSETITLE	L	T	P	C
19198DSC55_	DisciplineSpecific Elective-I	4	1	0	4

#### ObjectOrientedAnalysis&Design

#### AIM:

- Thisprogrammesthould promotestudents inthefieldof designingworld

#### OBJECTIVE:

- “Complex,Multi-facetedlearningoutcomesthatrequiresubstantialtimeandinstructiontoaccomplish”
- Educationalobjectives:derived fromglobal objectivesbybreaking“them downinto–

#### UNIT-I

Introductiontoobject-orientedDevelopment-object-orientedthemes—Modeling-Theobjectmodeling Technique- object and classes Links and Associations concepts- Generalization and Inheritance- Groupingconstructs.

#### UNIT-II

Advanced object modeling- Aggregation- Abstract classes- Extension and Restriction- Multipleinheritance-Metadata-Candidatekeys-Constraints.Dynamicmodeling:-Eventsandstates— Operations-Nestedstatediagram-Concurrency.Functionmodeling:-Functionalmodels-Dataflowdiagram- Specifyingoperations-Constraints.

#### UNIT-III

OMT as software Engineering Methodology- The OMT Methodology- impact of an object orientedApproach. Analysis: - Overview of analysis — problem statement — automated teller machine example —objectmodeling—Dynamicmodeling— functionalmodeling- addingoperationsiteratingtheanalysis.

#### UNIT-IV

System Design- overview of system design — Breaking a system into subsystem -- identifyingconcurrency — allocating subsystems to processors and tasks — management of data stores- handlingglobal resources — choosing software control implementation- handling boundary design — overview ofobjectdesign—combiningthethreemodels—designingalgorithms-designoptimization- implementationof control.

#### UNIT-V

Implementation: Implementation using a programming language- Implementation using a databasesystem. Programming style: object —oriented style — reusability — extensibility — Robustness - objectorientedlanguagefeatures— surveyof object —orientedlanguages.

#### OUTCOME:

**ThiscourseenshrinedthestudentcognitiveskillTe**

ObjectOrientedModelingandDesign—JamesRumbaugh,MichaelBlaha,WilliamPremerlani—  
PHITwelfth Printing—2001.

**ReferenceBook:**

Object Oriented Analysis and Design with Applications- Grady Booch Second Edition —  
PearsonEducationAsia publications.

**SEMESTER-V**  
**PRISTUNIVERSITY,THANJAVURB.COM**  
**PackageLab-V**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19120SEC05A</b>	<b>PackagesLab-V</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

*PHOTOSHOP*

1. Design aVisitingcard.
2. Design a Identitycard.
3. Design aletterpadwithLOGO.
4. CreateanadvertisementforNewspaper andPostercreation.
5. Design acalendarwithpictures.
6. Design aMagazine.
7. Createafrontpagefor aMagazine
8. Design aCDCover.

**SEMESTER-V**  
**PRIST UNIVERSITY, THANJAVURB.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC05B	SOFTSKILL-V LeadershipSkillsandBodyLanguage	0	0	3	2

**PART-VLeadershipSkillsandBodyLanguage**

**UNITI LeadershipSkills**

**Leaders:**theirskills,roles,andresponsibilities.Vision,Empoweringanddelegation,motivatingothers,organizationalskills,teambuilding,decisionmaking,givingsupport,Vision,Mission,Coaching,Mentoringandcounseling,Appraisalsandfeedback,conflict,PowerandPolitic,Organizingandconductingmeetings,PublicSpeaking

**UNITII Bodylanguage**

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



COURSECODE	COURSETITLE	L	T	P	C
19161SEC61	ManagementAccounting	5	1	0	6

**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  
Employability

**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

**OUTCOMES:**

The course helped the students to learn the analyzes and interpretation of financial statements and application of Marginal costing and Standard costing techniques.

**Reference Books**

1. Shashi K. Gupta & R. K. Sharma - Management Accounting
2. S: N. Maheswari - Management Accounting
3. R. Ramachandran and R. Srinivasan — Management Accounting
4. Hingorani and Ramanathan—Management Accounting

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM- CA

COURSECODE	COURSE TITLE	L	T	P	C
19198SEC62	IncomeTax LawandPractice	5	0	0	5

#### AIM

#### OBJECTIVES

##### 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.

##### Employability

##### 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:

#### Reference Books

1. Gaurand Narang- Income Tax Law and Practice
2. Jayakumar and Dr. Hariharan- Income Tax Law and Practice
3. Rajavelu—Income Tax Law & Practice  
Bagawathi Prasad—Income Tax



4.

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM- CA

COURSECODE	COURSE TITLE	L	T	P	C
19198SEC63	Database Management Systems	4	0	0	4

#### AIM

#### OBJECTIVES

##### 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 dynaset.

##### UNIT-IV:

Forms, reports, properties, wizards, macros, Access requirements, starting & quitting access, the access workspace & views.

##### UNIT-V:

Creating database & tables with & without wizard, field name, data types and properties, adding & deleting fields in fields.

#### OUTCOME:

#### References:

1. Working in MS-Office—“Ron Mansfield”(TMH)
2. Complete Reference Access 2002-Virginia Anderson(TMH)
3. Database-Management System—Silberchatz, Korth

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM-CA

COURSECODE	COURSE TITLE	L	T	P	C
19198DSC64_	Discipline Specific Elective-II <del>MULTIMEDIA</del>	4	0	0	4

**AIM:** This course provide to the students support of self-efficacy learning methods and strategies with visual-design tools

#### **OBJECTIVES: The Course will be able**

- to support and motivate the students coming from disadvantaged environments towards the achievement of their educational potential, through experiential learning;
- To back the development of a Virtual Reflective Learning approach to foster the real involvement of all the students.

#### **UNIT I**

Introduction to Multimedia-CDROM and the Multimedia highway—Use of Multimedia- Introduction to making Multimedia— Multimedia skills.

#### **UNIT II**

Multimedia hardware and software—Macintosh and windows production platforms—Connections-Memory and storage devices—Input devices—Output devices Communication devices—Basic software tools—

Text editing and word processing tools—Painting and drawing tools—3D modeling and animation tools-Making instant multimedia-Multimedia authoring tools.

#### **UNIT III**

Multimedia Building Blocks — Text — Fonts and Faces — Using Text in Multimedia: — Computers and Text — Font Editing and Design Tools - Hypermedia and hypertext — Sound — Multimedia System Sounds ~ MIDI Versus Digital Audio — Digital Audio - Making MIDI Audio - Audio File Formats — Images — Making Still Images — Color — Image File Formats- Animation- Principle of Animation — Making Animations That Work — Video—How Video Works—Integration Video Standards—Integrating computers and Television— Shooting and Editing— Video—Video Tips—Recording Formats— Digital Video.

#### **UNIT IV**

Multimedia and the Internet— The Internet and How it Works— Internetworking — Connections - Internet Services — The World Wide Web — Web Services- Web Browsers — Plug-ins and Delivery Vehicles — Designing for the World Wide Web— Working on the Web— Text for the Web— Images for the Web— Sound for the Web — Animation for the Web.

#### **UNIT V**

Assembling and Delivering a Project — Planning and Costing — Project Planning — Estimating — Designing and Producing — Content and Talent -- Using Content Created by others — Using Content Created for a Project — Delivering — Testing — Preparing for Delivery — Delivery — Delivering on CD — ROM — Delivering of World Wide Web.

#### **OUTCOME: This course encouraged the students to appear in**

#### **Multimedia World Text Book:**

Multimedia Making It Work—Fifth Edition-Tay Vaughan — Tata McGraw Hill Edition 2001

#### **Reference Books:**

- Multimedia In Action — James E. Shuman — Vikas Publishing House Multimedia an Introduction — John Villamil— Casanova, Louis Moliva,

## SEMESTER-VI

### PRISTUNIVERSITY, THANJAVURB.COM Open Elective-Journalism

COURSECODE	COURSE TITLE	L	T	P	C
191110EC	UG 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

**UNIT-II**

News – Definition – Kinds – Elements – Sources

**UNIT-III**

Reporters

**UNIT-IV**

The Editor and the Sub Editor

**UNIT –V**

Language of Journalism, Style and 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

**PRISTUNIVERSITY, THANJAVURB.COM**  
**Open Elective: Development of Mathematical Skills**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112OEC	<b>Open Elective: Development of Mathematical Skills</b>	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.

## SEMESTER-VI

PRISTUNIVERSITY, THANJAVURB.COM

Open Elective: Instrumentation

COURSE CODE	COURSE TITLE	L	T	P	C
19113OEC	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.

### 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 converters).

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-amp etc.

Acquire 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.

## SEMESTER-VI

PRISTUNIVERSITY, THANJAVURB.COM  
Open Elective: FOOD AND ADULTERATION

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:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislator 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 & Kapoor
2. Handbook of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B. Srilakshmi

## SEMESTER-VI

PRISTUNIVERSITY,THANJAVURB.COM

OpenElective:MushroomTechnology

COURSECODE	COURSETITLE	L	T	P	C
19117OEC	OpenElective:MushroomTechnology	4	0	0	2

### UNIT-1

Introduction-history-scope of edible mushroom cultivation-types of edible mushroom in India-calacybleindica, volvariella vulvae, pleurotus sp. Agaricus bisporus

### UNIT-II

Pure culture-preparation of media(PDA and oat meal agar media)sterilization-preparation of test tube slantstostoremotherculture-culturing of pleurotus mycelium on petri plates-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-cultural rack mushroom unit(Thatched mouse)-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

### REFERENCES:

1. Marimuthu et al., (1991) oyster mushrooms, Dept of plant pathology, TN AU, Coimbatore
2. Nita Bahl (1988) Handbook of mushrooms. II edition. 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, Philip G. Miles, Chang, S. T. (2004) Mushrooms: cultivation, nutritional value, medicinal effect and environmental impact, 2nd, CRC press.
5. Swaminathan M. (1990) food nutrition, bapco. The Bangalore printing and publishing co Ltd., Bangalore.



**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**  
**OpenElective -Web Technology**  
**SEMESTER-VI**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>191200EC</b>	<b>OpenElective Web Technology</b>	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**

**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 frontend webpage and connect to the backend databases.

**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.

Ordered and unordered lists – Table handling.

**SEMESTER-VI**

**PRIST UNIVERSITY,  
THANJAVURB.COM**

**Open Elective–E-COMMERCE AND ITS APPLICATIONS**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19122OEC</b>	<b>Open Elective E-Commerce and its Applications</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**AIM:**

To equip the students with PC hardware and software

**OBJECTIVES:**

- 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**

Introduction to the Personal Computer – Safe Lab Procedures and Tool use – Computer Assembly – Step by step.

**UNIT II**

Basics of Preventive maintenance and troubleshooting – Fundamental Operating Systems – Fundamental Laptops and Portable Devices

**UNIT III**

Fundamental printers and scanners – Fundamental networks – Fundamental security

**UNIT IV**

Advanced personal computers – Advanced operating systems – Advanced Laptops and portable devices.

**UNIT V**

Advanced printers and scanners – Advanced networks – Advanced security.

**OUTCOMES:**

Understand and be able to use Assembly Language.

Understand number systems and the ASCII character set as to how they relate to developing and writing Assembly Language programs.

Understand the basic architectural structure, and the various hardware components including Input/output, Memory, and Control Systems.

Understand the purpose of each of the architecture registers..

Recognize the relationship of high-level programming language constructs to the equivalent Assembly Language instructions.

**REFERENCE BOOKS:**

“IT Essentials PC Hardware and Software Labs and Study Guide”, Third Edition – Patrick Regan – Cisco Press – Pearson Education (Chapters 1-9, 11-16)

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19120SEC06A	SkillbasedElective-VI PackagesLab-VI	0	0	2	1

#### FLASH

1. Drawing and painting original art in flash.
2. Creating simple objects using flash.
3. Creating a frame-by-frame animation techniques.
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 techniques movie clip and graphics symbols.

**SEMESTER-VI**

**PRISTUNIVERSITY, THANJAVUR**

**B.COM-CA**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC06B	SOFT SKILL– VI LifeSkills andOtherSkills	0	0	3	2

**PART-VI LifeSkills andOtherSkills**

**UNIT I LifeSkills**

**LifeSkills**- Knowshow to use technology to communicate safely and effectively. - Knowshow 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 Other Skills**

Meditation. Improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity.

## SEMESTER-VI

PRIST UNIVERSITY,

### THANJAVURB.COM-CA

CourseCode	CourseTitle	L	T	P	C
19111SEC06L	CommunicativeEnglishLab-VI	0	0	2	1

**Aim:**

- To develop communicative skills

**Objective:**

- To write simple, compound and complex sentences
- To extract the main ideas from a text
- To shorten a text
- To enhance writing skills
- To learn to manage time and stress
- To widen creative thinking

- To enrich the skill of working in a group

**Outcome:**

- Develop communicative skills
- To be a good team worker

#### UNIT –I

Simple, Compound and Complex

#### UNIT –II

Note making

#### UNIT –III

Precise writing

#### UNIT –IV

Developing a story

#### UNIT –V

Essay writing

**Lab Note-** Creative thinking, Time management, Stress management, Assertiveness, Group discussion from Globarena Software

**Viva-** Group discussion

**Exam components-** Theory-50+MCQ online exam-20+Viva-15+Lab note-15=100

**References:-**

English Grammar -

Wren and Martin English Grammar and Composition -

Radhakrishna Pillai

Technical Communication - Meenakshi Sharma & Sangeetha

Sharma Essentials of Business Communication - Rajendra

Pal & J.S. Korlahalli Sultan Chand & Sons

# PRISTUNIVERSITY, THANJAVUR

## B.COM-CA

### 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

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: Prescribed Research

Level 2: Bounded

ResearchLevel 3: Scaffold

ResearchLevel4:SelfactuatedR

esearchLevel5:Open Research

TakingintoconsiderationtheabovementionedfactsinrespectofintegratingresearchintotheB.Com curriculum,thefollowingResearchSkillBasedCoursesareintroducedintheB.Comcurriculum.

<b>Semester</b>	<b>RSBCourses</b>	<b>Credits</b>
II	Research LedSeminar	1

III	ResearchMethodology	3
V	ParticipationinBounded Research	2
VI	ProjectWork	4

**Blueprintforassessmentofstudent’sperformanceinResearchLedSeminarCourse**

- **InternalAssessment:** **40Marks**
  - SeminarReport(UG)/ConceptNote(PG) : 5 X4=20 Marks
  - SeminarReviewPresentation : 10Marks
  - Literature Survey :10 Marks
  
- **SemesterExamination :** **60Marks**  
(EssaytypeQuestions set bythe concerned resourcepersons)

**Blueprint for assessment of student’s performance in Research Methodology**

**CoursesContinuousInternalAssessment:** **20Marks**

- Research Tools(Lab): 10Marks
- Tutorial: 10Marks

**ModelPaperWriting:** **40Marks**

- Abstract: 5Marks
- Introduction: 10Marks
- Discussion: 10Marks
- ReviewofLiterature: 5 Marks
- Presentation: 10Marks

**SemesterExamination:** **40Marks**

**Total:** **100Marks**





**SCHOOL OF COMMERCE AND BUSINESS MANAGEMENT DEPARTMENT  
OF COMMERCE  
B.Com – REGULATION  
2019 COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER-I</b>					
19110 AEC11/ 19132AEC11/ 19111AEC11/ 19135AEC11	Tamil – I /Hindi–I/ Advanced English- I/French-I	4	0	0	2
19111AEC12	English – I	4	0	0	2
19161SEC 13	Basic Accounting	5	0	0	4
19161SEC 14	Business Environment	5	0	0	4
19161AEC15	Marketing	4	0	0	4
19161AEC16	Business Economics	4	0	0	3
191SEC01_____	Skill Based Elective Course–I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	0	0	0	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>3</b>	<b>22</b>
<b>SEMESTER-II</b>					
19110 AEC21/ 19132AEC21/ 19111AEC21/ 19135AEC21	Tamil– II/Hindi – II/ Advanced English– II/French-I	4	0	0	2
19111AEC22	English–II	4	0	0	2
19161SEC 23	Business Accounting	5	0	0	4
19161SEC 24	Ethics in Business	4	0	0	4
19161AEC25	Business Statistics	5	0	0	4
19161AEC26	Business Organization and Management	4	0	0	3
19161RLS27	Research Led Seminar	-	-	-	1
191—SEC02--	Skill Based Elective Course–II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	1	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>3</b>	<b>22</b>
<b>SEMESTER- III</b>					
19110 AEC31/ 19132AEC31/ 19111AEC31/ 19135AEC31	Tamil– III/Hindi – III/ Advanced English–III French-III	4	0	0	2
19111AEC32	English–III	4	0	0	2
19161SEC 33	Cost Accounting	5	0	0	4

	EMPLOYABILITY
	ENTREPRENEURSHIP
	SKILL DEVELOPMENT

19161SEC 34	Banking Theory Law and Practice	4	0	0	4
19161AEC35	Business law For Managers	4	0	0	4
19161AEC36	Essentials of Business Communication	4	0	0	3
19161RMC37	Research Methodology	2	0	0	2
191--SEC03--	Skill Based Elective Course –III	0	0	2	1
19111SEC03L	Communicative English Lab –III	0	0	1	1
	<b>Total</b>	<b>27</b>	<b>0</b>	<b>3</b>	<b>23</b>
	<b>SEMESTER- IV</b>				
19110AEC41/ 19132AEC41/ 19111AEC41/ 19135AEC41	Tamil – IV /Hindi –IV / Advanced English – IV/French-IV	4	0	0	2
19111AEC42	English –IV	4	0	0	2
19161SEC 43	Partnership Accounts	5	0	0	4
19161SEC 44	Advertising and sales Promotion	4	0	0	4
19161AEC45	Company Law and Secretarial Practice	4	0	0	4
19161AEC46	Office management	4	0	0	3
191--SEC04--	Skill Based Elective Course –IV	0	0	2	1
19111SEC04L	Communicative English Lab -IV	0	0	1	1
191ENVTSTU	Environmental studies	2	0	0	2
	<b>Total</b>	<b>27</b>	<b>0</b>	<b>3</b>	<b>23</b>
	<b>SEMESTER- V</b>				
19161SEC51	Corporate Accounting	5	0	0	5
19161SEC52	Financial Management	5	1	0	5
19161SEC53	Financial Services	5	0	0	4
19161SEC54	Computer Application in Business	5	1	0	4
19161DSC55 -	Discipline Specific Elective– I	5	0	0	4
19161BRC56	Participation in Bounded Research	-	-	-	2
191--SEC05--	Skill Based Elective Course –V	0	0	2	1
19111SEC05L	Communicative English Lab –V	0	0	1	1
	<b>Total</b>	<b>25</b>	<b>2</b>	<b>3</b>	<b>26</b>
	<b>SEMESTER- VI</b>				
19161SEC61	Management Accounting	5	1	0	5
19161SEC62	Entrepreneurship and Small Business Management	5	0	0	5
19161SEC63	Auditing	4	1	0	4
19161DSC64 -	Discipline Specific Elective–II	5	0	0	4
191--OEC--	Open Elective	4	0	0	2
19161PRW66	Project Work	-	-	-	4
191--SEC06--	Skill Based Elective Course –VI	0	0	2	1
19111SEC06L	Communication English Lab –VI	0	0	1	1
19161EXACT	Extension activities	0	0	0	1
19161PEE	Program Exit Examination	0	0	0	2
	<b>Total</b>	<b>23</b>	<b>2</b>	<b>3</b>	<b>29</b>
	<b>Total Credits of the Programme</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>145</b>

	EMPLOYABILITY
	ENTREPRENEURSHIP
	SKILL DEVELOPMENT

### DISCIPLINESPECIFICSELECTIVECOURSES

SEMESTER	COURSECODE	COURSE TITLE
V	19161DSC55A 19161DSC55B	StockExchange Practice CooperativeLawandPractice
VI	19161DSC64A 19161DSC64B	Income Tax Law and PracticeCo-OperationTheory

### OpenElectives

Semester	OpenElectiveCourses
V	a) 19110OEC-TamillakkiyaVaralaru b) 19111OEC-Journalism c) 19112OEC-DevelopmentofMathematicalSkills d) 19113OEC-Instrumentation e) 19114OEC-Foodand Adulteration f) 19116OEC-WildlifeConservation g) 19120OEC-E-Learning h) 19122OEC-Webtechnology

### SkillbasedElectives

Semester	SkillbasedElectiveCourses
I	a) 19120SEC01AL-PackageLab-I b) 19160SEC01B-Softskill -I
II	a) 19120SEC02AL-PackageLab-II b) 19160SEC02B-Softskill- II
III	a) 19120SEC03AL-PackageLab-III b) 19160SEC03B-Softskill- III
IV	a) 19120SEC04AL-PackageLab-IV b) 19160SEC04B- _Softskill-IV
V	a) 19120SEC05AL-PackageLab-V b) 19160SEC05B-Softskill -V
VI	a) 19120SEC06AL-PackageLab-VI b) 19160SEC06B-Softskill- VI

### B.COMCREDITDISTRIBUTION

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	11	10	-	-	-	01	22
II	11	10	-	-	01	-	22
III	11	10	-	-	02	-	23
IV	11	10	-	-	-	02	23
V	-	20	04	-	02	-	26
VI	-	16	04	02	04	03	29
Total	44	76	08	02	09	06	145

- 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.சுரதா - தேன்மழை, கலப்பை , 22 அடிகள்
9. கண்ணதாசன் - இலக்கியம் , ஒரு பாளையின் 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

## DEPARTMENT OF ENGLISH

## SYLLABUS FOR UG PART I - ENGLISH - REGULATION 2019

Course Code	Course Title	L	T	P	C
19111AEC11	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 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

## SYLLABUS FOR UG PART II - ENGLISH - REGULATION 2019

Coursecode	CourseTitle	L	T	P	C
19111AEC12	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 &amp; 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

**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

**PRIST UNIVERSITY,  
THANJAVURB.COM**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19161SEC13	BasicAccounting	5	0	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 – Self balancing – Single Entry System.  
**EMPLOYABILITY**

**UNIT – IV**

Final accounts of trading and – Non Trading Concerns.

**UNIT – V**

Depreciation – Methods Fixed – Diminishing Annuity – Depreciation Fund – Provisions and Reserves – Fire Claims.

**OUTCOME**

Students are now familiarized with the basic accounting principles and practices and the ascertainment of profit and the financial statement of the business.

**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

## SEMESTER-I

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC14	BusinessEnvironment	5	0	0	4

#### 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 – Economic 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.

#### 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

#### EMPLOYABILITY

#### OUTCOME

The course helped the students to understand the different types of environments which influence a business.

#### REFERENCE BOOKS

1. Dr.S.Sankaran– Business Environment
2. Dr.C.B.Gupta– Business Environment
3. Dr.P.K.Ghosh– Business Environment
4. V.Alagappan– Business Environment
5. Dr.D.N.Dwivedi– Business Environment



**PRIST UNIVERSITY,  
THANJAVURB.COM**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19161AEC15	Marketing	4	0	0	4

**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 – Kind 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**

The course helped the students to know the principles and Practices of Marketing Mix and Marketing Research.

**REFERENCE BOOKS**

1. Rajan Nair – Marketing Management.
2. Philip Kotler – Principles of Marketing.
3. Varshaney – Marketing Management.
4. Arun Kumar – Marketing.
5. S. Ramesh Kumar – Marketing.
6. P. Saravanel – Marketing.

## SEMESTER-I

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161AEC16	Business Economics	4	0	0	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 Business Economics–  
Objectives of Business Economics –Nature of Business Economics – Economics Laws–Micro–  
Macro Economics.

#### UNIT – II

Demand Analysis –Demand Curves–Elasticity of Demand–Indifference Curves.

#### UNIT – III

Production Function–Factors of Production–Law of Return–Cost of Production–Curve–  
Scale of Production– Economics of Large Scale Production.  
Employability

#### 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.

#### OUTCOME

The student learned the basic principles of Economics which help them in making logical business decisions.

#### REFERENCE BOOKS:

1. K.P.M.Sundaram & EN. Sundaram–Business Economics.
2. S.Sankaran–Business Economics.
3. PN.Reddy & Appanaiyah -Business Economics.

**SEMESTER-I**  
**PRIST UNIVERSITY, THANJAVURB.COM**  
**Package Lab -**

**1MS-WORD**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC01A	PackagesLab-I	0	0	2	1

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

**SEMESTER-I**  
**PRIST UNIVERSITY, THANJAVURB.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
191_ _SEC01B	SOFTSKILLI	0	0	3	2

**Part-IEffectiveCommunication**

**UNITI**                      **EffectivecommunicationI**

**OralCommunication:** Listening skills -Speaking skills (what to say and how to say it) – Gender neutral Language -Conflict, criticism, anger -Telephone skills.

**UNITII**                      **EffectivecommunicationII**

**Written Communication:** Mechanics of writing, letters, notes, and reports- Resume preparation Faxes-Web sites-Email and Memos.

**Nonverbal Communication:** Behavior, Body language and Attitude.

**SEMESTER-I**  
**PRIST UNIVERSITY, THANJAVURB.COM**

CourseCode	CourseTitle	L	T	P	C
19111SEC01L	CommunicativeEnglishLab-I	0	0	1	1

**Aim:**

- To acquaint with the basic grammar and develop language skills

**Objective:**

- To know English grammar and all the concomitant linguistic items
- To learn about the auxiliary and the models
- To understand the types of sentences and its patterns
- To enrich vocabulary
- To familiarize the features, process, forms and barriers of communication
- To enhance listening skill

**Outcome:**

- Understand grammar
- Develop listening skill

**UNIT –I**

Parts of speech

**UNIT – II**

Kind of Sentences, Patterns of sentences

**UNIT – III**

Auxiliaries, Modals

**UNIT –IV**

Communication-Characteristics-Process-Forms-Barriers-Types

**UNIT-V**

Listening-benefits-types-good listener-active and passive listening-Effective listening  
Lab Note-1. Word Mentor - Level I Words and their meaning-Root and usage-Fill in the blanks-  
Synonyms-Antonyms-Match the Words, Listening activity from  
Global arena Software 2. Vocabulary diary Viva-Listening activity  
Exam components-Theory-50+MCQ online exam-vocabulary-20+Viva-15+Labnote-15=100

**References:-**

English Grammar - Wren and  
Martin English Grammar and Composition -  
Radhakrishna Pillai  
Technical Communication - Meenakshi Sharma & Sangeetha  
Sharma Essential of Business Communication -  
Rajendra Pal & J.S Korlahalli Sultan Chand & Sons

**PRIST UNIVERSITY,  
THANJAVURB.COM**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
191INDCONS	IndianConstitution	1	0	0	1

**AIM**

To learn the fundamental and features of Indian Constitution.

**OBJECTIVES**

- I. To make the students understand about the Democratic Rule and Parliamentary Administration.
- II. To appreciate the salient features of the Indian Constitution.
- III. To know the fundamental Rights and Constitutional Remedies.
- IV. To make familiar with powers and positions of the Union Executive, Union Parliament and the Supreme Court.
- V. 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 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.

**OUTCOME**

1. Democratic values and citizenship Training are gained.
2. Awareness on Fundamental Rights are established.
3. The functions 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.

**REFERENCE BOOKS:**

1. Paleker 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.

- 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. திரிகூடராசப்ப 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)

**SEMESTER-II****PRIST UNIVERSITY,  
THANJAVURB.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC21	AdvancedEnglish-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 M

emos **UNIT****T–II**

Itinerary Che

cklist **UNIT****–III**

Invitation Ci

rcular **UNIT****–IV**

Instruction Recom

mendations **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 &amp; Sangeetha Sharma Inspiring Lives - Maruthi Publishers

English Workbook-I &amp; II

- Jewelcy Jawahar



## SEMESTER-II

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111AEC22	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

-Gowri Sivaraman Emerald Publishers

## SEMESTER-II

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161SEC23	BusinessAccounting	5	0	0	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

#### Unit-IV

Consignment-Joint venture

#### Unit-V

Insurance claims for loss of profits-Insolvency accounts-statement of affairs-Insolvency of individual only.

Employability

#### OUTCOME

The students gained knowledge on accounting mechanism which is necessary for the preparation of the business accounting.

#### REFERENCE BOOKS

1. Jain and Narang-Advanced Accountancy
2. A. Arulanandam & Rajan-Advanced Accountancy-Himalaya Publishers.
3. Reddy and Murthy-Financial Accounting-Murgham Publications.

PRIST UNIVERSITY,  
THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161SEC24	EthicsinBusiness	4	0	0	4

**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.

**EMPLOYABILITY**

**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

**OUTCOME**

The course helped the students to know the importance of ethical principles in day to day business activities.

**REFERENCE BOOKS:**

1. A.C.Fernanando – Business Ethics – Peason Publications.
2. Biswath – Ethics and Management and Indian Ethics – Vidya Vikas.
3. Dr.C.B.Gupta – Values and Ethics in Business – Sultan Chands & 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.

## SEMESTER-II

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161AEC25	BusinessStatistics	5	0	0	4

#### 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.  
EMPLOYABILITY

#### UNIT - IV

Times 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.

#### OUTCOME

The courses sharpened the analytical skills of the students to the business data effectively.

#### REFERENCE BOOKS

1. P.Navaneetham – Business mathematics
2. S.P.Gupta – statistical methods
3. C.B.Gupta – statistical methods

## SEMESTER-II

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161AEC26	Business Organization and Management	4	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.

#### 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.

#### EMPLOYABILITY

#### OUTCOME

The course guided the student to know the fundamentals and the special characteristics of various business organization and Management.

#### 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

PRIST UNIVERSITY, THANJA VURB.COM

Course Code	Course Title	L	T	P	C
19120SEC02A	PackagesLab-II	0	0	2	1

### MS-EXCEL

1. Prepare the addressing methods in excel
2. Describe the type of function
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 preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare an Inventory Preparation
8. Prepare an Electricity Bill Preparation

## SEMESTER-II

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
191__SEC02B	SOFTSKILLII	0	0	3	2

### Part-II Self Development

#### 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

## SEMESTER-II

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111SEC02L	CommunicativeEnglishLab-II	0	0	2	1

### Aim:

- To acquaint with the basic grammar and develop language skills

### Objective:

- To understand the different tenses and use it in sentences
- To form sentences
- To know subject verb agreement
- To enrich vocabulary
- To read and comprehend the context

### Outcome:

- Understand grammar
- Develop reading skills

### UNIT-1

Tenses-Simple, Perfect

### UNIT -II

Tenses-Continuous, Perfect continuous

### UNIT -III

Forming sentences-positive, negative and questions

### UNIT -IV

Concord

### UNIT -V

Reading-benefits-purpose-techniques-types-Effective reading

Lab Note-1. Word Mentor - Level II Words and their meaning-Root and usage-Fill in the blanks-

Synonyms-Antonyms-Match the Words, reading activity from Globarena

Software 2. Newspaper Article notebook

Viva-Reading activity

Exam Components-Theory-50+MCQ online exam-20+Viva-15+Lab note-15=100

### References:-

- English Grammar - Wren and Martin
- English Grammar and Composition - Radhakrishna Pillai
- Technical Communication - Meenakshi Sharma & Sangeetha Sharma
- Essentials of Business Communication - Rajendra Pal & J.S. Korlahalli Sultan Chand & Sons



- 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 . 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 . நளவேண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

- 9 . காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

## SEMESTER-III

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111AEC31	AdvancedEnglish-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

## SEMESTER-III

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111AEC32	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

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC33	CostAccounting	5	0	0	4

#### AIM

To ascertain the costs 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 – Re Apportionment and Absorption.

Employability

#### 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.

#### OUTCOME:

The students gained knowledge on cost ascertainment and cost control.

#### 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.

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC34	BankingTheoryLaw andPractice	4	0	0	4

#### 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.

Employability

#### 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.

#### OUTCOME:

The course helped the students to understand the basic important functions and principles and practices of Banking Theory Law in day to day business.

#### REFERENCE BOOKS

1. B.S.Raman-Banking, Theory, Law and Practice
2. S.M.Sundaram -Banking Theory Law and Practice

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161AEC35	Business Law for Managers	4	0	0	4

#### 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  
Employability

#### 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

#### OUTCOME:

The course helped in gaining knowledge of basic laws and rules governing the business.

#### REFERENCE BOOKS

1. N.D. Kapoor – Elements of commercial law.
2. M.C. Shukla – Mercantile law.
3. P.P.S. Gogna – A Text book of Business Law.
4. S.N. Maheswari – Mercantile law.

## SEMESTER-III

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161AEC36	Essentials of Business Communication	4	0	0	3

#### AIM

To master the art of communication in the business matters 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

Business communication – Need and importance – Principles of letter writing – structure and layout of letters – Commercial terms and abbreviations – Modern Electronic communication system and their uses.

#### UNIT – II

Quotations, Orders and Execution, status enquires, Trade and Bank references, sales letters, circular letters

#### UNIT – III

Claim and adjustment letters – credit and collection letters – job application letters – Banking letters

#### UNIT – IV

Letters relating to agency – Export and Import Correspondence – Government correspondence – Precise writing

#### UNIT – V

Drafting of business reports – Press reports – Market reports – Letter to Editor – Speech writing  
Skill development

#### OUTCOME:

The course helped the students in developing and improving their communicative skills to sustain in the competitive Business World.

#### REFERENCE BOOKS

1. Rajendrapal and Korlahalli - Business Communication
2. M.S. Ramesh and Pattenshetty - Effective Business English & Correspondence

## SEMESTER-III

PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161RMC37	Research Methodology	3	0	0	3

### 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:

The course helped the students to learn the research process, Research design, the different types of research, formulation of hypothesis, data collection and data processing and the preparation of the research report.

### 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

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19120SEC03A	PackagesLab-III	0	0	2	1

#### POWERPOINT

1. Create a slideshow 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 slideshow presentation for a science exhibition
  - a. Create Non-bulleted and bulleted text
  - b. Apply appropriate text attributes
3. Create a slideshow 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 slideshow 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 slideshow presentation for a shop advertisement to be open shortly
6. Create a slideshow 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 slideshow presentation for a tourist's places
8. Create a slide for a calendar using appropriate text attributes and insert an object from a bitmap file

## SEMESTER-III

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
191__SEC03B	SOFTSKILLIII	0	0	3	2

### **Part-III Interpersonal Relations and Social Responsibilities**

#### **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, Interdependence, 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.

## SEMESTER-III

PRIST UNIVERSITY, THANJAVURB.COM

	CourseCode	CourseTitle	L	T	P	C
<b>Aim:</b>	19111SEC03L	CommunicativeEnglishLab-III	0	0	2	1

- Toacquaintwiththebasicgrammar anddeveloplanguageskills

### Objective:

- Tochangeasentencefromactivetopassive andviceversa
- Tomakesentences
- Towrite aletter
- Toimprovevocabulary
- Toenhancespeakingskills
- Toenrich writingskills

### Outcome:

- Understandgrammar
- Developspeakingandwritingskills

### UNIT –1

ActiveandPassive

### UNIT –II

Developingthe hints

### UNIT –III

Letterwriting

### UNIT –IV

Speaking-benefits-featuresofa goodspeaker-Tipforimprovingspeech-types

### UNIT –V

Writing-benefits-types-tipsforimprovingwriting

**Lab Note-**1. Anagrams, Word Traps, Stinging Words, letter writing from Globarena Software, Self-introduction,2. Picturewritingnote book

**Viva-**Selfintroduction,Picturetalk

**Examcomponents-**Theory-50+MCQonlineexam -20+Viva-15+Labnote-10=100

### References:-

EnglishGrammar -Wren and

MartinEnglishGrammarandComposition -

RadhakrishnaPillai

TechnicalCommunication -Meenakshi Sharma & Sangeetha

SharmaEssentialsofBusinessCommunication-RajendraPal&J.SKorlahalliSultan

Chand&Sons

- 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

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111SEC41	AdvancedEnglish-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

#### – 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 Workbook-I & II - Jewelcy Jawahar

**SEMESTER-IV**  
**PRIST UNIVERSITY, THANJAVURB.COM**

CourseCode	CourseTitle	L	T	P	C
19111AEC42	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 Tempe  
 st

**References:-**

English for Enrichment -  
 .Devaraj Emerald Publishers Selected Scenes from Shakespeare Book I&II - Emerald  
 Publishers

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC43	PartnershipAccounts	5	0	0	4

#### AIM:

#### OBJECTIVES:

- I. To provide students an exposure to understand the practice of Partnership Accounts II.

#### 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.

#### Employability

#### 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 - Garner 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.

#### 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.

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC44	AdvertisingandSales Promotion	4	0	0	4

#### 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 sales person 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

Employability

#### UNIT – IV

Personal Selling – Meaning and importance, kinds of salesmanship, Sales force management, Characteristic 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

#### OUTCOME:

The course helped the students to understand the importance of Advertising and Salesmanship in a highly competitive business world.

#### 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
6. Rathor – Advertising Management



## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161AEC45	CompanyLawandSecretarialPractice	4	0	0	4

#### 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

Employability

#### 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:

To course helped the students to learn the different terminologies in company law and secretarial practice.

#### REFERENCE BOOKS

1. N.D. Kapoor - Company Law & Secretarial Practice
2. Shukla and Gulshan – Company Secretarial Practice
3. Tandon – Company Secretary Practice
4. P.K. Ghosh – Company Secretarial Practice

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161AEC46	OfficeManagement	4	0	0	3

#### 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

Employability

#### UNIT – IV

Office correspondence and mail – Communications system –  
Office and Management Cost reduction and cost control

#### UNIT – V

Mailing services, inward and outward mail

#### OUTCOME:

The course helped the students to know the importance of Office Management in the present competitive world.

#### REFERENCE BOOKS

1. G.P. Tarry - Office Management and Control
2. Lettingwell & Rokingson - 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

**SEMESTER-IV**

**PRIST UNIVERSITY, THANJAVURB.COM**

**PackageLab-IV**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04A	PackagesLab-IV	0	0	2	1

**MS-ACCESS**

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the university exams
3. Create a database for sorting the date of joining by the employee in the organization.
4. Create queries to select records that match specific conditions
5. Create relationships among the different tables
6. Create queries using built-in functions
7. Develop forms to enter data into the student marks database
8. Develop forms to enter data into the employee database

## SEMESTER-IV

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
191__SEC04B	SOFTSKILLIV	0	0	3	2

### PART-IV Etiquette And Interviewing Skills

#### 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.

## SEMESTER-IV

PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19111SEC04L	CommunicativeEnglishLab-IV	0	0	1	1

### Aim:

- To develop communicative skills

### Objective:

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To improve presentation skill
- To enrich vocabulary

### Outcome:

- Understand grammar
- Develop language and presentation skills

### UNIT –I

Direct and Indirect

### UNIT –II

Comprehension

### UNIT –III

Conversation

### UNIT –IV

Descriptive Writing

### UNIT –V

Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception

**Lab Note-**Confusing Words, Word families, Non-

English words, Presentation skills, Oral presentation, Conversation from Global arena software

**Viva-**Presenting a topic

**Exam components-**Theory-50+MCQ online exam-20+Viva-15+Lab note-15=100

### References:-

English Grammar

-Wren and

Martin English Grammar and Composition

-

Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma & Sangeetha

Sharma Essential of Business Communication-Rajendra

Pal & J.S. Korlahalli Sultan Chand & Sons

Soft skills

-D. Jayacandran D.J Publishers

## GLOBAL ENAS SOFTWARE

### Objective:

- To hone LSRW skills through emerging techniques
- To comprehend meaning from text to words
- To cultivate the habit of reading
- To make the students proficient in pronunciation
- To improve the listening skill

### Outcome:

- Develop LSRW skills

Phonetics

Listening

Comprehension Reading

Comprehension Word Ment

or-Level I & II

- Words and their meaning
- Root and usage
- Fill in the blanks
- Synonyms
- Antonyms
- Match the Words

### Lab Note:

Word Mentor - Level I &

II Listening

Comprehension Reading

Comprehension Newspaper

Article

### Viva:

Listening

Comprehension Reading

Comprehension **Exam**

**Components** Theory exam

50

Lab note 10

Listening Comprehension 20

Reading Comprehension 20

Total 100

### Theory exam pattern:

Section A 10\*2=20

Section B

2\*15=30

Total =50

## SEMESTER-IV

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
191ENVTSTU	Environmentalstudies	1	0	0	1

#### UNIT-I

The Multidisciplinary Nature of Environmental Studies– Definition, Scope and Importance–Need for Public awareness- natural Resources: Renewable and Non – Renewable Resources- ForestResources– WaterResources-MineralResources-FoodResources–EnergyResources–LandResources.

#### 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, foodwebs and ecological pyramids – Types of ecosystem – Forest ecosystem – Greenland ecosystem – Desertercosystem – Aquaticecosystems.

#### UNIT –III

Biodiversity and its Conservation – Definition- Genetic, Species and ecosystem diversity – Biogeographical classification of India – Values of biodiversity – Biodiversity at global, National and locallevels–Indiaasamega–diversitynation–Hot-spotsofbiodiversity-Threatstobiodiversity–Endangeredand endemicspecies of India– Conversation ofbiodiversity.

#### UNIT-IV

Environmental Pollution – Definition – Air Pollution – Water pollution –Soil Pollution- MarinePollution- Noise Pollution –Thermal Pollution – Nuclear hazards –Solid waste Management –Role of anindividualin prevention ofpollution– Disaster management.

#### UNIT-V

Social Issues and the Environment – From Unsustainable to Sustainable development- Urbanproblemsrelatedtoenergy–Waterconservation,rainwaterharvesting,watershedmanagement- Environmental Ethics – Climate change greenhouse effect and global warming – Ozone depletion – Wasteland reclamation –Consumerism and waste products–Environmental Legislation –Issues involved inenforcementofenvironmental legislation – Publicawareness-Humanpopulation andtheenvironment.

#### TEXTBOOK:

‘ENVIRONMENTALSTUDIES’,K.Kumarasamy,A.AlagappaMoses,M.vasanthy.

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**  
**SEMESTER-V**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19161SEC51	Corporate Accounting	5	0	0	5

**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 evaluation 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:**

The course helped the students to familiarize with the basic accounting practices of corporate businesses.

**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 – Advanced Accountancy Vol. – II.
5. Dr. R. Ramachandarn and Dr. R. Srinivasan – Corporate Accounting



## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC52	FinancialManagement	5	1	0	5

#### 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 – Organizations 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.  
Employability

#### UNIT -IV

Leverage 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

The students gained rich knowledge on financial decisions making and composition of different securities in the total capital structure.

#### 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
- R. Ramachandran, R. Srinivasan – Financial management

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161SEC53	Financial Services	5	0	0	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.

#### 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.

#### Employability

#### OUTCOME

This course helped the students to compare and analyze the performance of various financial services available in the financial marketing.

#### REFERENCE BOOKS

1. Gordon, Natarajan – Financial Market and Services.
2. Dr.S. Gurusamy – Financial services and Market.
3. Kuccho I.S.C. – Financial Management  
Pandey I.M. – Financial Management

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161SEC54	Computer Application in Business	5	1	0	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 taskbar – Creation of file and folder – windows 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.

#### 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:

The course helped the students to gain knowledge on Computer Application for various business activities.

#### REFERENCE BOOKS

1. Computer Applications in Business – K Mohan Kumar and Dr. S.Rajkumar – The MC Graw Hill Publication.
2. Computer Applications in Business with Tally ERP9 – By S.V.P.Rizwan Ahmed – Margham Publication.
3. Srinivasa Vallaban – Computer Applications in Business.
4. K.Mohankumar and Dr.S.Rajkumar – Computer Application in Business.
5. Deva Publication – Compentaniced Accounting under Tally.

## SEMESTER-V

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161DSC55A	Elective Paper-I-A-Stock Exchange Practice	5	0	0	4
19161DSC55B	Elective Paper-II-B-Co-operative Law and Practice				

### Elective paper-I-A-Stock Exchange Practice

#### 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

To provide an introduction to the financial markets and to analyze the role of financial markets for the broader macro. The course will help them in building career in stock market/broking houses. To help them 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

#### UNIT-V

Commodity exchanges: evolution and history – role in globalizing economy – governing regulations – price – risk management – commodity exposure

#### OUTCOMES:

Students will get a basic introduction to stocks as well as learn practical applications of how to invest. This course aims to help students build the ability and knowledge to make their own decisions with their investment decisions in the stock market.

#### Text Book:

1. Punithavathy Pandian, "Security Analysis and Portfolio Management", Vikas Publishing House Pvt. Ltd.
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.

Sanjeev Agarwal, A Guide to Indian Capital Market, Bharat Publishers

SEMESTER-V

PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161DSC55A	Elective Paper-I-A-Stock Exchange Practice	5	0	0	4
19161DSC55B	Elective Paper-II-B-Co-operative Law and Practice				

**Elective paper-II-B-Co-operative Law and Practice**

**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.

**Reference Books**

1. Tamil Nadu Co-operative Societies Act, 1983.
2. Tamil Nadu Co-operative Societies Rules 1988.
3. Modern Co-operative Societies Act Product and Companies Act.

**SEMESTER-V**  
**PRIST UNIVERSITY, THANJAVURB.COM**  
**PackageLab -V**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19120SEC05A</b>	<b>PackagesLab-V</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

PHOTOSHOP

1. Design a Visiting card.
2. Design a Identity card.
3. Design a letter pad with LOGO.
4. Create an advertisement for Newspaper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

**SEMESTER-V**  
**PRIST UNIVERSITY, THANJAVURB.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
191__SEC05B	SOFTSKILLV	0	0	3	2

**PART-V Leadership Skills and Body Language**

**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 Politics, 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

**SEMESTER-V**  
**PRIST UNIVERSITY, THANJAVURB.COM**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111SEC05L	CommunicativeEnglishLab-V	0	0	2	1

**Aim:**

- To develop communicative skills

**Objective:**

- To understand the degrees of comparison
- To build up a thought
- To write a resume
- To construct a report, agenda and minutes
- To prepare for an interview

**Outcome:**

- Develop communicative skills
- To get a job

**UNIT –I**

Degrees of comparison

**UNIT –II**

Proverb expansion

**UNIT –III**

Resume writing

**UNIT –IV**

Interview

**UNIT –V**

Corporate skills - body language - etiquette - good manners - interpersonal skills

**Lab Note-** Report writing, Resume writing, Interview from Globarena software, Writing agenda, Writing minutes

**Viva-** Mock Interview

**Exam components-** Theory-50+MCQ online exam-20+Viva-15+Lab note-15=100

**References:-**

English Grammar - Wren and

Martin English Grammar and Composition -

Radhakrishna Pillai

Technical Communication - Meenakshi Sharma & Sangeetha

Sharma Essential of Business Communication-

Rajendra Pal & J.S Korlahalli Sultan Chand & Sons



## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSETITLE	L	T	P	C
19161SEC61	ManagementAccounting	5	1	0	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.  
Employability

#### 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.

#### OUTCOME

The course helped the students to learn the analyzes and interpretation of financial statements and applications of Marginal costing and Standard costing techniques.

#### REFERENCE BOOKS

1. Shashi K. Gupta & R. K. Sharma – Management Accounting
2. S. N. Maheswari – Management Accounting
3. R. Ramachandran and R. Srinivasan – Management Accounting
4. Hingorani and Ramanathan – Management Accounting

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<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17161SEC62	Entrepreneurship and Small Business Management	5	0	0	5

**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.  
**ENTREPRENURSHIP**

**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.

**OUTCOME:**

The course helped the student to learn the role of entrepreneurs and small businesses in the economic development of the country.

**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 – Entrepreneurial Development.
5. Dr. P. T. Vijayshree – Entrepreneurship & Small Business Management

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM

COURSECODE	COURSE TITLE	L	T	P	C
19161SEC63	Auditing	4	1	0	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 Check 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

The course helped the students to learn the principles and practices of auditing of various business organizations.

#### REFERENCE BOOKS

1. B.N.Tandon–‘A Practical Handbook of Auditing’
2. Dinkar Pagare–‘Principles and Practice of Auditing’
3. R.G.Saxena–‘Principles and Practice of Auditing’
4. Rupram Gupta–Auditing

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**SEMESTER-VI**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19161DSC64A 19161DSC64B	Elective paper – I- A- Income Tax Law and Practice Elective paper – II- B- Co-operation Theory	5	0	0	4

**Elective paper-I-A-Income Tax Law and Practice**

**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.

**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.

**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

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVUR.B.COM

COURSECODE	COURSETITLE	L	T	P	C
19161DSC64A 19161DSC64B	Elective paper – I- A- Income Tax Law and Practice Elective paper – II- B- Co-operation Theory	5	0	0	4

#### Elective paper-II-A-Co-operation Theory

##### 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

##### 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

##### REFERENCE BOOKS

1. B.S.Mathur-Co-operation Theory
2. Hajeela-Principles of Co-operation
3. Rangasamy– Co-operation

**SEMESTER-VI**

**PRIST UNIVERSITY, THANJAVURB.COM**  
**OpenElective-Journalism**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111OEC	OpenElective-Journalism	4	0	0	2

**Aim:**

- To acquaint with the basic knowledge of journalism so that it may entice 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 and 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

## SEMESTER-VI

PRIST UNIVERSITY, THANJAVURB.COM

**Open Elective: Development of Mathematical Skills**

COURSE CODE	COURSE TITLE	L	T	P	C
19112OEC	<b>Open Elective: Development of Mathematical Skills</b>	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.

## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM Open Elective: Instrumentation

COURSE CODE	COURSE TITLE	L	T	P	C
19113OEC	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.

#### 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 volt meter and ammeter- resistance meter- Amplified D.C. meter- Chopper stabilized amplifier- A.C. Voltmeter using rectifiers- Electronic multimeter- Differential volt meter- 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 converter (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.

**PRIST UNIVERSITY,  
THANJAVURB.COM  
Open Elective: Mushroom Technology**

COURSE CODE	COURSE TITLE	L	T	P	C
19117OEC	Open Elective: Mushroom Technology	4	0	0	2

**UNIT-1**

Introduction-history-scope of edible mushroom cultivation-types of edible mushroom in India-calocybe indica, volvariella vulvae, pleurotus sp. Agaricus bisporus

**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 petri plates-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-cultural 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

**REFERENCES:**

1. Marimuthu et al., (1991) oyster mushrooms, Dept of plant pathology, TNAU, Coimbatore
2. Nita Bahl (1988) Handbook of mushrooms. II edition. Vol. I & II
3. Paul Stamets, J. Sand 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, CRC press.
5. Swaminathan M. (1990) food nutrition, bapco. The Bangalore printing and publishing co Ltd., Bangalore.

## SEMESTER-VI

PRIST UNIVERSITY, THANJAVURB.COM

Open Elective: FOOD AND ADULTERATION

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:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislator 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 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.

### References:

1. The Food Safety and Standard Act, 2006 – Seth & Kapoor
2. Handbook of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B. Srilakshmi

**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**  
**OpenElective -Web Technology**

<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19120OEC</b>	<b>OpenElectiveWeb Technology</b>	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 webpage 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 frontend webpage and connect to the backend databases.

**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

**SEMESTER-VI**

**PRIST UNIVERSITY,  
THANJAVURB.COM**

**Open Elective–E-COMMERCE AND ITS APPLICATIONS**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	<b>Open Elective</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>
<b>19122OEC</b>	<b>E-Commerce and its Applications</b>				

**AIM:**

To equip the students with PC hardware and software

**OBJECTIVES:**

- 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**

Introduction to the Personal Computer – Safe Lab Procedures and Tool use – Computer Assembly – Step by step.

**UNIT II**

Basics of Preventive maintenance and troubleshooting – Fundamental Operating Systems – Fundamental Laptops and Portable Devices

**UNIT III**

Fundamental printers and scanners – Fundamental networks – Fundamental security

**UNIT IV**

Advanced personal computers – Advanced operating systems – Advanced Laptops and portable devices.

**UNIT V**

Advanced printers and scanners – Advanced networks – Advanced security.

**OUTCOMES:**

Understand and be able to use Assembly Language.

Understand number systems and the ASCII character set as to how they relate to developing and writing Assembly Language programs.

Understand the basic architectural structure, and the various hardware components including Input/output, Memory, and Control Systems.

Understand the purpose of each of the architecture registers..

Recognize the relationship of high-level programming language constructs to the equivalent Assembly Language instructions.

**REFERENCE BOOKS:**

“IT Essentials PC Hardware and Software Labs and Study Guide”, Third Edition – Patrick Regan – Cisco Press – Pearson Education (Chapters 1-9, 11-16)

**SEMESTER-VI**

**PRIST UNIVERSITY,  
THANJAVURB.COM  
Open Elective – Banking Services**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>C</b>
19161OEC	Open Elective - <b>BANKING SERVICES</b>	4	0	2

**AIM**

To provide the Bank is financial institution which is involved in borrowing and lending money.

**OBJECTIVES:**

- I. To provide lending money to firms, customers and home buyers.
- II. To provide keep money for customers
- III. To provide offering financial advice and related financial services, such as insurance.

**UNIT – I**

Banking-Functions-Features-Types-Merits and Demerits.

**UNIT – II**

Retail banking-Mobile banking-Online banking-Merchant banking.

**UNIT – III**

Savings-Deposits-Types-Financial institutions-Nonfinancial institutions.

**Unit – IV**

Loans-Treasury Services-Merchant Services-Business banking.

**Unit-V**

Foreign exchange-History of banking-List of banking services.

**OUTCOMES:**

The course helped the students to make money, Banks used deposit and wholesale deposit, share equity and fees interest from dept. Loans and consumer lending, Such as Credit cards and bank fees.

**REFERENCES:**

1. Elements of Banking and Insurance-Jyotsna Sethi & Nishwan Bhatia
2. Banking Theory law and practice-Santhanam
3. Banking Awareness -N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh, Justin paul.

## SEMESTER-VI

PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19120SEC06A	SkillbasedElective-VI PackagesLab-VI	0	0	2	1

### FLASH

1. Drawing and painting original art in flash.
2. Creating simple objects using flash.
3. Creating a frame-by-frame animation techniques.
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 techniques movie clip and graphics symbols.

**SEMESTER-VI**  
**PRISTUNIVERSITY, THANJAVUR**  
**B.COM**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
191__SEC06B	SOFTSKILLVI	0	0	3	2

**PART-VI LifeSkills and Other Skills**

**UNIT I            LifeSkills**

**LifeSkills**- Know how to use technology to communicate safely and effectively. - Know 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 Other Skills**

Meditation. Improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity.



## SEMESTER-VI

### PRIST UNIVERSITY, THANJAVURB.COM

CourseCode	CourseTitle	L	T	P	C
19111SEC06L	CommunicativeEnglishLab-VI	0	0	2	1

#### Aim:

- To develop communicative skills

#### Objective:

- To write simple, compound and complex sentences
- To extract the main ideas from a text
- To shorten a text
- To enhance writing skills
- To learn to manage time and stress
- To widen creative thinking
- To enrich the skill of working in a group

#### Outcome:

- Develop communicative skills
- To be a good team worker

#### UNIT –I

Simple, Compound and Complex

#### UNIT –II

Note making

#### UNIT –III

Precise writing

#### UNIT –IV

Developing a story

#### UNIT –V

Essay writing

**Lab Note**-Creative thinking, Time management, Stress management, Assertiveness, Group discussion from Globarena Software

**Viva**-Group discussion

**Exam components**-Theory-50+MCQ online exam-20+Viva-15+Labnote-15=100

#### References:-

English Grammar -

Wren and Martin English Grammar and Composition -

Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma & Sangeetha



**PRIST UNIVERSITY,**

**THANJAVURB.COM**

## **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. 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:engagingin researchdiscussions

Herethefocus is on students and staffcriticallydiscussingongoingresearch in thediscipline.

Allfourwaysofengagingstudentswithresearchandinquiryarevalidandvaluableandcurriculumcanand should containelements of them.

Moreover,thestudentparticipationinresearchmaybeclassifiedas,Level

1: Prescribed Research

Level 2: Bounded

ResearchLevel 3: Scaffold

ResearchLevel4:SelfactuatedR

esearchLevel5:Open Research

TakingintoconsiderationtheabovementionedfactsinrespectofintegratingresearchintotheB.Com curriculum,thefollowingResearchSkillBasedCourses areintroducedintheB.Comcurriculum.

Semester	RSBCourses	Credits
II	Research LedSeminar	1
III	ResearchMethodology	3
V	ParticipationinBounded Research	2
VI	ProjectWork	4

**Blueprintforassessmentofstudent'sperformanceinResearchLedSeminarCourse**

- **Internal Assessment:**  
**40 Marks**
  - Seminar Report(UG)/Concept Note(PG) : 5 X4=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**



**PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY (PRIST)**  
**(Institution Deemed to be University U/S3 of UGC Act 1956)**

**THANJAVUR-613403**



**BACHELOR OF BUSINESS ADMINISTRATION CURRICULUM**

**(2019 ONWARDS)**

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 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.

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: Societal

Research Level 4: Self-actuated

Research Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the BBA 2019 Curriculum, the following Research Skill Based Courses are introduced in the BBA 2019 Curriculum.

Semester	RSB Courses	Credits
II	Research Led Seminar	1
III	Research Methodology	3
V	Participation Bounded Research	2
VI	Project Work	4



## BLUEPRINT FOR ASSESSMENT OF STUDENT'S PERFORMANCE IN RESEARCH LED SEMINAR COURSE

<b>Internal Assessment:</b>	<b>40 Marks</b>
• Seminar Report (UG)/Concept Note (PG)	: 5X 4=20 Marks
• Seminar Review Presentation	
• Literature Survey	: 10 Marks
<b>Semester Examination:</b>	
	: 10 Marks
	<b>60 Marks</b>
(Essay type Questions set by the concerned resource persons)	

## BLUEPRINT FOR ASSESSMENT OF STUDENT'S PERFORMANCE IN RESEARCH METHODOLOGY

<b>COURSE CONTINUOUS INTERNAL ASSESSMENT:</b>	<b>20 MARKS</b>
• Research Tools (Lab):	10 Marks
• Tutorial:	10 Marks
<b>MODEL PAPER WRITING:</b>	<b>40 MARKS</b>
• Abstract:	5 Marks
• Introduction:	10 Marks
• Discussion:	10 Marks
• Review of Literature:	5 Marks
• Presentation:	10 Marks
<b>SEMESTER EXAMINATION:</b>	<b>40 MARKS</b>
<b>Total:</b>	<b>100 Marks</b>

**BACHELOR OF BUSINESS ADMINISTRATION CURRICULUM (2019 ONWARDS)**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SEMESTER I</b>					
19110AEC11/ 19131AEC11/ 19111AEC11	Tamil I//Hindi I/Advanced English I	4	0	0	2
19111AEC12	English I	4	0	0	2
19160SEC13	Core-I Principles of Management	5	0	0	3
19160SEC14	Core-II Managerial Economics	5	0	0	3
19160AEC15	Allied-I Business Communication	5	0	0	4
19160AEC16	Allied-II Business Mathematics and Statistics	4	0	0	3
19120SEC01A L	Skill Based Elective Course - I	0	0	2	1
19111SEC01L	Communicative English Lab- I	0	0	1	1
191ETHVALS	Ethics and Values	0	0	0	0
<b>SEMESTER II</b>					
19110AEC21/ 19131AEC21/ 19111AEC21	Tamil II/Hindi II/ Advanced English II	4	0	0	2
19111AEC22	English II	4	0	0	2
19160SEC23	Core-III Financial Accounting	5	0	0	3
19160SEC24	Core-IV Organizational Behaviour	5	0	0	3
19160AEC25	Allied-III Business Environment	5	0	0	4
19160AEC26	Allied-IV Management Information System	4	0	0	3
19160RLC27	Research Led Seminar	0	0	0	1
19120SEC02A L	Skill Based Elective Course - II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	1	1
<b>SEMESTER III</b>					
19110AEC31/					

19131AEC31/ 19111AEC31	TamilIII/Hindi III/AdvancedEnglish III	4	0	0	2
19111AEC32	EnglishIII	4	0	0	2
19160SEC33	Core–VManagementAccounting	4	0	0	3
19160SEC34	Core–VIMarketingManagement	4	0	0	3
19160AEC35	Allied-VBusiness Law	5	0	0	4
19160AEC36	Allied-VIHumanResourceManagement	4	0	0	3
19160RMC37	ResearchMethodology	2	0	0	2
19120SEC03A L	SkillBasedElectiveCourse - III	0	0	2	1
19111SEC03L	CommunicativeEnglish - III	0	0	1	1
<b>SEMESTERIV</b>					
19110AEC41/ 19131AEC41/ 19111AEC41	TamilIV/Hindi IV/AdvancedEnglish IV	4	0	0	2
19111AEC42	EnglishIV	4	0	0	2
19160SEC43	Core- VIITotalQualityManagement	5	0	0	3
19160SEC44	Core-VIIICost Accounting	4	0	0	3

19160AEC45	Allied-VII Retail Management	4	0	0	4
19160AEC46	Allied-VIII Industrial Relations and Labour Law	4	0	0	3
19120SEC04A L	Skill Based Elective Course-IV	0	0	2	1
19111SEC04L	Communicative English-IV	0	0	1	1
191ENVTSTU	Environmental Studies	2	0	0	2
<b>SEMESTER V</b>					
19160SEC51	Core-IX Financial Management	6	0	0	5
19160SEC52	Core- X Services Marketing	5	0	0	3
19160SEC53	Core-XI Production and Operations Management	5	0	0	3
19160SEC54	Core-XII Global Business Management	6	0	0	4
19160DSC54	Discipline Specific Elective -I	5	0	0	3
19160BRC55	Participation Bounded Research Employability	0	0	0	1
19120SEC05A L	Skill Based Elective Course -V	0	0	2	1
19111SEC05L	Communicative English Lab-V	0	0	1	1
<b>SEMESTER VI</b>					
19160SEC61	Core- XIII Business Policy and Strategic Management	5	0	0	4
19160SEC62	Core-XIV Entrepreneurial Development	6	0	0	5
19160SEC63	Core-XV Logistics and Supply Chain Management	5	0	0	4
19160DSC64	Discipline Specific Elective -II	5	0	0	3
191--OEC65	Open Elective	4	0	0	2
19160PRW66	Project Work	0	0	0	4
19120SEC06A	Case Study Analysis	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	1	1
191EXACT	Extension Activity	0	0	0	0
19160PEE	Programme Exit Examination Employability	0	0	0	1
	<b>TOTAL</b>	-	-	-	<b>127</b>

Semester	ElectiveNo	CourseCode	CourseTitle
V	I	19160DSC54A	Advertisingandsalesmanship
		19160DSC54B	InvestmentManagement
VI	II	19160DSC64A	CustomerRelationshipManagement
		19160DSC64B	FinancialServices

### Open Elective Courses

Semester	CourseCode	CourseTitle	Department
VI	19117OEC	Mushroom Technology	Microbiology
	19120OEC	WebTechnology	ComputerScience
	19114OEC	FoodandAdulteration	Chemistry

### SkillBasedElectiveCourses

Semester	ElectiveNo	CourseCode	CourseTitle
I	I	19120SEC01A	Fundamentals of Computers
		19160SEC01B	SoftSkills- I
II	II	19120SEC02A	MsofficePackages Lab

		19160SEC02B	SoftSkills-II
III	III	19120SEC03A	Writing and Presentation Skills Lab
		19160SEC03B	SoftSkills -III
IV	IV	19120SEC04A	General Aptitude and Personality Development Lab
		19160SEC04B	SoftSkills-IV
V	V	19120SEC05A	Photoshop Lab
		19160SEC05B	SoftSkills- V

SEMESTER-I

- 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.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



CourseCode	CourseTitle	L	T	P	C
19111AEC11	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  
Sons English for writers and translators - Sultan Chand &  
Technical Communication - Robin Macpherson  
Sharma The World's Great Speeches - Meenakshi Sharma & Sangeetha  
Publishers English Workbook-I&II - Sudhir Kumar Sharma Galaxy  
- Jewelcy Jawahar

Coursecode	CourseTitle	L	T	P	C
19111AEC12	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 Gnanadasan

**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

Lovepoem forawife

-A.KRamanujam

UNIT-V

OliverTwist

-CharlesDickens

REFERENCES:-

TheArtofReading/ExperiencingPoetry.

-S.MurugesanandDr.K.Chellappan

EmeraldPublishers

CourseCode	CourseTitle	L	T	P	C
19160SEC13	PRINCIPLESOFMANAGEMENT	5	0	0	3

**AIM:** To enhance production and productivity, decrease cost of production and maximize prosperity both for employer and employees having common interests.

### 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.

**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.

**PREREQUISITE:** Introduction to the management process, emphasizing planning and strategy, and organizational behavior, direction and control including leadership, motivation, team building, management information systems.

#### UNIT-I

Organization - Management – Importance – concepts- Nature – functions- Role of managers- Management and administration – Evolution of management thought – Modern management approaches– MBO–Merits and Demerits.

#### UNIT-II

Nature and purpose of planning – Planning process - types of plans - strategies – Types of strategies– Decision Making-Types -Process-Rational decision making process.

#### UNIT-III

Nature and purpose of organizing-Organization structure–Process of organization– Span of control–Delegation of authority, responsibility–Accountability

Departmentalization–

–Centralization and decentralization-Selection and Recruitment.

Skill development

#### UNIT-IV

Directing–Principles–Elements–

Motivation, Theories of motivation: Maslow, Herzberg, Vroom models – Communication-Hurdles to effective communication

#### UNIT– V

Control–Controlling–Need for control–Control process–Control techniques. Leadership leadership theories– Styles –Managerial grid. Co-ordination– meaning–need –types.

#### REFERENCES:

- L.M.Prasad–Sultan Chand&Sons.
- T.M.Ramasamy–Himalaya Publishing House.
- P.C.Tripathi, P.N.Reddy–Tata McGraw– Hill Publishing House.

CourseCode	CourseTitle	L	T	P	C
19160SEC14	MANAGERIALECONOMICS	5	0	0	3

### MANAGERIALECONOMICS

**AIM:** Economics is inevitable to business and hence to teach basic of economics to students of Business Administration

#### 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

#### 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.

**PREREQUISITE:** A minimum level knowledge to understand and applications of Economics

**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.**

### **Skill development**

#### **TEXTBOOK**

1. Dr. Sankaran S., “Managerial Economics”, Margham Publications, 1999.

#### **References:**

1. Varshney & Maheswari, “Managerial Economics”, Sultan Chand & Sons, 2007. 2. Victor L. Mote & Samuel Paul, “Managerial Economics”, Tata McGraw-Hill Education, 1977



CourseCode	CourseTitle	L	T	P	C
19160AEC15	BUSINESSCOMMUNICATION	5	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

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.

## Entrepreneurship

## 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, Press Reports, Market Reports – Proposal Writing. Technology – Aided Business Communication – Internet, E-Mail, Web-based Communication, IT Trends in Communication.

## 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

- BusinessCommunication -Kathiresan–Dr,Radha–PrasanaPublishers.

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.

**Prerequisite:** The learners should have Elementary knowledge in mathematics and statistics.

**COURSE OBJECTIVES;** To develop the students ability to deal with numerical and quantitative issues in business . To enable the use of statistical, graphical and algebraic techniques wherever relevant. To have a proper understanding of Statistical applications in Economics and Management.

#### UNIT-I FUNDAMENTALS OF BUSINESS MATHEMATICS

**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-II INTRODUCTION TO STATISTICS

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

#### Skill development

#### 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

#### TEXT BOOKS

- Statistical Methods – S.P. Gupta
- Fundamentals of Statistics – D.L. Elhance
- Business Mathematics and Statistics – N. G. Das and J.K. Das.

#### REFERENCES:

- Economics and Business Statistics – M. Sivathanupillai
- Elements of Statistics – B.N. Asthana
- Schaum's outline of Statistics – Murray R Spiegel and Larry J. Stephens

CourseCode	CourseTitle	L	T	P	C
19120SEC01AL	FUNDAMENTALSOFCOMPUTERS	0	0	2	1

**Aim:** This is a basic course to practically learn the fundamentals of computer operations. It helpsthelearner to knowtheapplications of computersin thefield ofBusiness.

**Prerequisite:**Thelearner shouldhaveelementaryknowledgeaboutcomputers.

## OBJECTIVES

The main objective of this course is to introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of computer hardware and software, the Internet, networking and mobile computing. It focuses on such computer literacy that prepares students for life-long learning of computer concepts and skills. Students discovers why computers are essential components in education, business and society in this course.

## COURSE OUTCOMES

- Converse in basic computer terminology
- Formulate opinions about the impact of computers on society
- Possess the knowledge of basic hardware peripherals
- Know and use different number systems and the basics of programming
- Solve basic computational problems with C language

### UNIT I BASICS OF COMPUTER AND ITS EVOLUTION

Evolution of computer, Characteristics of computers, Various fields of application of computers, Advantages and Limitations of computer, Classification of computers

i) **On the basis of technology** (Digital, Analog and Hybrid)

ii) **On the basis of processing speed and storage capacity** (Micro, Mini, mainframe and Super)

iii) On the basis of Purpose (General & Special), Different Generation of computers (I to V),

#### UNIT III INPUT AND OUTPUT DEVICES

Keyboard, Mouse, Joystick, Digitizer, Scanner, MICR, OCR, OMR, Light Pen, Touch Screen, Bar Code Reader, Voice Input Device, Monitor and its type (VGA, SVGA and XGA), Printer and its type (Impact and Non-Impact with example), Plotter

#### UNIT III COMPUTER MEMORY

Primary Memory (ROM and its type – PROM, EPROM, EEPROM, RAM) Secondary memory – SASD, DASD Concept, Magnetic Disks – Floppy disks, Hard disks, Magnetic Tape, Optical disks – CD ROM and its type (CD ROM, CD ROM-R, CD ROM-EO, DVD ROM) Flash Memory

#### Unit IV Operating

#### System Concept

Introduction to operating system; Function of OS, Types of operating systems, Booting Procedure, Start-up sequence, Details of basic system configuration, Important terms like Directory, File, Volume, Label, Drive name, etc.

#### UNIT V CONCEPT OF DATA COMMUNICATION AND NETWORKING:

Networking Concepts, Types of networking (LAN, MAN & WAN), Communication Media.

#### Skill development

#### TEXT BOOKS:

1. Leon and Leon; *Introduction to Information Technology*, Leon Tech World.
2. Microsoft Office-2000 Complete-BPB Publication.

#### REFERENCES:

1. Sinha, Kr. Pradeep and Preeti Sinha; *Foundation of Computing*, BPB Publication.
2. Jain, V.K.; *Computers and Beginners*

CourseCode	CourseTitle	L	T	P	C
191ETHVALS	ETHICSANDVALUES	0	0	0	0

**UnitI** IntroductiontoEthics–Personalvalue–FamilyValue–SelfEsteem–Anger–Leadership– PersonalityDevelopment

**UNITII**

BusinessEthics–CorporateSocial Responsibility–CorporateGovernance

**UnitIII** ProfessionalEthics–EthicalDecisionMaking– RoleofBusinessProfessionalinCorporate- currentissues in businessthat areaaffected byethical concerns.

**EMPLOYABILITY**

**UnitIV**

MassMediaEthics –AdvertisingEthics – SocialResponsibilities ofMassmedia

**UNITV**

EnvironmentalEthicsandValues–ConsumerAwareness andRights–HumanRights

**REFERENCES:**

**N.S.Raghunathan-ValueEducation**, Margham Publications -Chennai



SEMESTERII

- 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
19111AEC21	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  
Memo  
Circular

**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 Workbook - I & II - Jewelcy Jawahar

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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19111AEC22	ENGLISH-II	4	0	0	2
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**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

TheFortuneTeller

-KarelCapek

Proposal

-AntonChekov

**REFERENCES:-**

GatheredWisdom

-GowriSivaramanEmeraldPublishers

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC23	FINANCIALACCOUNTING	5	0	0	3

**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.

**PreRequisite:** The Learners should have introductory knowledge about accounting.

**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.

#### 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

#### 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

#### Skill development

#### UNIT-IV

**Depreciation Accounting:** Introduction, Meaning of Depreciation, Causes for Depreciation, Need for Depreciation, Computation of the Amount of Depreciation, Depreciation on Addition 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.



TEXTBOOK:

- Advanceaccounting–S.P.JainandK.L.Narang–KaliyaniPublisher.
- PrinciplesofAccounting–FinneryH. A. MillerH EPrenticeHall
- PrinciplesofFinancialAccounting–S.N.Maheshwari

CourseCode	CourseTitle	L	T	P	C
19160SEC24	ORGANIZATIONALBEHAVIOUR	5	0	0	3

**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.

**PreRequisite:** The Learners should have basic interpersonal skill and Human behaviour

### 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.

#### 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 – Group Dynamics – Formal and Informal Groups, Group Norms, Group Cohesiveness, Group Behaviour and Group Decision – making.

#### UNIT-III

Leadership – Concept – Qualities of effective Leadership – Leadership Styles - Definition of Power – Types of Power – Sources of power – Power and Politics.

#### UNIT-IV

Definition of Authority – Characteristics – Types of Authority – Organizational conflict, source of conflicts – Types of conflicts – Job frustration and causes.

#### UNIT-V

Motivation – Concept – Nature – significance – Theories of Motivation – Maslow's need hierarchy theory – Mc Gregor's Theory X and Theory Y – Herzberg Two Factor Theory - Stress Management – Concept – Sources – Effects of stress – Management of Stress.

Employability

TEXTBOOK:

## Organizational Behaviour – L.M.PRASAD

### REFERENCES:

- Organization Theory and Behaviour – V.S.P. RAO & D.S. Narayana
- Organizational Behaviour - Uma Sekaran
- Organizational Behaviour - K. Aswathappa
- Stephen P. Robins, Organisational Behavior, PHI Learning / Pearson Education, 11th edition, 2008.
- Fred Luthans, Organisational Behavior, McGraw Hill, 11<sup>th</sup> Edition, 2001

CourseCode	CourseTitle	L	T	P	C
19160AEC25	BUSINESSENVIRONMENT	5	0	0	4

**AIM:**To enable the learner to understand the various business and economic environments in a changing business 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-sectors of economy and their significance-agriculture, industry-service-multinational corporations-meaning-importance-advantages-weakness.

### Skill development

#### UNIT-IV

Technological environment- choice of technology- problems in selecting appropriate technology-importance to business-social responsibility-meaning-importance-responsibility towards various interest groups.

#### 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'.
- HavgVK, 'Economic Environment of Business'.
- Amarchand D, Government and Business.

Course Code	Course Title	L	T	P	C
19160AEC2 6	MANAGEMENT INFORMATION SYSTEM	4	0	0	3

### 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.

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.

#### Skill development

#### 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.

#### REFERENCES:

- O'Brien, James A, Management Information Systems.
- Sadogopans, Management Information System, PHI.
- Lucas, Management Information System.

CourseCode	CourseTitle	L	T	P	C
19120SEC02A	MSOFFICEPACKAGES	0	0	2	1

**Aim:** The learner of this course will learn the different features and applications of Microsoft packages in office automation and Professional Management of Business Concern.

**Prerequisite:** This course does not require any prerequisite knowledge for the learner. The learners should have primary knowledge about computers and its uses.

#### MS-WORD

**Introduction to Ms-Word** - What is Word-Processing, Important Features of Ms-Word, Getting Started with Ms-Word, Main menu option.

**Creating and Editing a documents** - Creating a Documents, Entering Text In the documents, Moving Around the documents, Editing Operations, Inserting, Replacing and Deleting Character, Using the toolbar.

#### **Formatting a Document-**

Character Formatting, Line Spacing, Alignment, Boarding and Shading, Page Breaks, Columns, Changing Case, Adding and Removing Numbers. **Advanced Formatting-** Tab Setting, Indenting, Margins, Header and Footer, Spell Checking the Documents, Creating and Managing Tables.

**Mail Merge** - What is Mail Merge, Concepts of Mail Merge and its Components, Mail Merge option of word

#### MS-EXCEL

**Introduction to Ms-Excel** – Creating, saving, Opening, Closing, and Naming the worksheet, entering data in worksheet.

**Performing Calculations in Ms-Excel** – Writing Formula – Inserting formulas – Application of various formula tools.

**Creating Charts and Diagrams in Ms-Excel** – Creating Charts, Selecting chart and Chart elements, moving and Resizing Charts, Changing Chart type, Data ranges, Chart Style, Chart Layout.

**Sorting and Filtering Data** – Sorting of Data, Sorting options, Custom sorting etc.



**Ms-PowerPoint**

**IntroductiontoMs-PowerPoint**– Opening,Closing,Creatingand SavingaPresentation.

**CreatingaPresentation**–InsertingaSlide–Addingtexttoslides–Formattingtext–  
usingofvariousmenu and tools.

**UsingClipartandSmartart**–Inserting, Formattingclipartandsmartart.

### Applying Animation and Transition–

Adding Slide Transition and animation, Adding Custom animation.

**Inserting Videos, Sounds and Objects-** Inserting Sounds, voice clips, audios, videos, charts and objects.

#### REFERENCES:

- Microsoft Office 2016 step by step by Joan Lambert and Curtis Frye, Published by Microsoft Press.
- Microsoft Office Reference Guide by Tom Bunzel, **Publisher:** InformIT.com (2007)

Course Code	Course Title	L	T	P	C
19111SEC02L	COMMUNICATIVE ENGLISH LAB-II	0	0	1	1

#### AIM:

- To acquaint with the basic grammar and develop language skills

#### OBJECTIVE:

- To understand the different tenses and use it in sentences
- To form sentences
- To know subject verb agreement
- To enrich vocabulary
- To read and comprehend the context

#### OUTCOME:

- Understand grammar
- Develop reading skills

#### UNIT–1

Tenses-Simple, Perfect

## UNIT-II

Tenses-Continuous,Perfectcontinuous

## UNIT-III

Formingsentences-positive,negativeandquestions

## UNIT-IV

Concord

## UNIT-V

Reading-benefits-purpose-techniques-types-Effectivereading

## LABNOTE-

1. WordMentor- LevelIIWordsandtheirmeaning-Rootand usage-Fillintheblanks-

Synonyms-Antonyms-MatchtheWords,readingactivityfromGlobarena Software

2. NewspaperArticlenotebook

VIVA-READINGACTIVITY

ExamComponents-Theory-50+MCQonlineexam-20+Viva-15+Labnote-15=100

REFERENCES:-

1. EnglishGrammar -Wren andMartin
2. EnglishGrammarandComposition -RadhakrishnaPillai
3. TechnicalCommunication -Meenakshi Sharma&SangeethaSharma
4. Essentials of Business Communication-Rajendra Pal &J.S Korlahalli Sultan Chand &Sons



SEMESTER III

- 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 . 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
19111AEC31	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 adverti  
sement

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

CourseCode	CourseTitle	L	T	P	C
19111AEC32	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 - Stuart H. King Blackie Books One-  
Act plays of Today - T. Prabhakar Emerald Publishers

Course Code	Course Title	L	T	P	C
19160SEC33	MANAGEMENT ACCOUNTING	4	0	0	3

**AIM:** To help students understand the nature and scope of management accounting. Gain knowledge in the preparation of financial statement analysis, fund flow and Cash flow analysis. Utilize the management tools and techniques to take appropriate financial decisions.

### 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.

**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.

## 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

### Skill development

## REFERENCES:

- Management Accounting – S.N. MAHESWARI, Sultan Chand & Sons.
- Manmohan and S.N. Gopal - Principle of Management Accounting
- Guthmann H.G. Analysis of Financial Statements, New Delhi.
- Anthony R. N. Management Accounting – Text and Cases.

Course	Course Title	L	T	P	C
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19160SEC34	MARKETING MANAGEMENT	4	0	0	3
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**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.

**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 – Pricing methods.

**Employability**

**UNIT - IV** Marketing channels -Need and importance – Classification – Types of Intermediaries – Wholesalers – Functions – Retailers – Functions - Physical distribution – Elements of physical distribution(logistics)

**UNIT - V** Promotion mix - Personal selling –Process - Advertising – Objectives – Types - Sales promotion– Objectives– Sales promotion methods, publicity and public relations.

**TEXTBOOK:**

1. Ramaswamy and Namakumari, Marketing Management 3/e Revised MacMillan India Ltd

**REFERENCES:**

1. Philip Kotler, Marketing Management, Prentice Hall of India.
2. Philip Kotler and Armstrong, Marketing Management
3. Saxena, Marketing Management, Tata McGraw Hill Pub
4. Pillai & Bhagavathi, Modern Marketing
5. Sherlekar, Marketing Management
6. Varshney R L and Gupta S L, Marketing Management



<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160AEC3 5	BUSINESS LAW	5	0	0	4

**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.

#### 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.

#### Skill development

#### 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.

Course Code	Course Title	L	T	P	C
19160AEC3 6	HUMAN RESOURCE MANAGEMENT	4	0	0	3

**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.



CourseCode	CourseTitle	L	T	P	C
19160RMC3 7	RESEARCH METHODOLOGY	3	0	0	3

**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

**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.

**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.

**Employability**

**REFERENCES:**

1. C.R.Kothari: Research Methodology, Wiley Eastern Ltd, New Delhi

2. P.Saravanel,ResearchMethodology,KitabMahal,Allahabad.
- 3.O.R.Krishnaswami : Methodologyof Researchin Social Science
- 4.D.Amarchend:ResearchMethodsInCommerce

CourseCode	CourseTitle	L	T	P	C
19120SEC03A L	WRITINGANDPRESENTATION SKILLS	0	0	2	1

**AIM:** To familiarize students with different modes of general, academic and Business writing. To help them master writing techniques to meet academic and professional needs. To introduce them to the basics of academic and Professional presentation. To sharpen their accuracy in writing.

**UNIT I** Writing as a skill – its importance – mechanism of writing – words and sentences – paragraph as a unit of structuring a whole text – functional use of writing – personal, academic and business writing.

**UNIT II** Writing process - planning a text – finding materials- drafting – revising – editing - finalizing the draft – computer as an aid – keyboard skills – word processing

**UNIT III** Writing models – essay - précis - expansion of ideas – dialogue - letter writing – personal letters, formal letters – CV – surveys – questionnaire - e-mail – fax – job application – report writing.

#### Skill development

**UNIT IV** Academic writing - writing examinations - evaluating a text - note-making- paraphrasing – summary writing - planning a text – organizing paragraphs – introduction – body – conclusion – rereading and rewriting – copy editing – accuracy.

**UNIT V** Presentation as a skill - elements of presentation strategies – audience – objectives – medium – key ideas - structuring the material - organizing content - audio-visual aids – handouts - use of power point - clarity of presentation - non-verbal communication - seminar paper presentation and discussion.

**REFERENCES:**  
English for Effective Communication. Oxford University Press, 2013.

**FURTHER READING:**

1. Robert, Barraas. Students Must Write. London: Routledge, 2006.
3. Hamp-Lyons, Liz, Ben Heasley. Study Writing. 2nd Edition. Cambridge Uty Press, 2008.
4. Ilona, Leki. Academic Writing. CUP, 1998.
5. McCarter, Sam, Norman Whitby. Writing Skills. Macmillan India, 2009.
6. Jay. Effective Presentation. New Delhi: Pearson, 2009.

CourseCode	CourseTitle	L	T	P	C
19111SEC03L	COMMUNICATIVE ENGLISH LAB-III	0	0	1	1

**AIM:**

- To acquaint with the basic grammar and develop language skills

**OBJECTIVE:**

- To change a sentence from active to passive and vice versa
- To make sentences
- To write a letter
- To improve vocabulary
- To enhance speaking skills
- To enrich writing skills

**OUTCOME:**

- Understand grammar
- Develop speaking and writing skills



ActiveandPassive

**UNIT-II**

Developingthe hints

**UNIT-III**

Letterwriting

**UNIT-IV**

Speaking-benefits-featuresofagoodspeaker-Tipforimprovingspeech-types

**UNIT-V**

Writing-benefits-types-tipsforimprovingwriting

**LabNote-**1.Anagrams, WordTraps,StingingWords,letterwritingfromGlobarenaSoftware,Self-introduction,2. Picturewritingnote book

**Viva-**Selfintroduction,Picturetalk

**Examcomponents-**Theory-50+MCQonlineexam -20+Viva-15+Labnote-10=100

**REFERENCES:-**

EnglishGrammar -Wren and  
MartinEnglishGrammarandComposition -RadhakrishnaPillai  
TechnicalCommunication -Meenakshi Sharma & Sangeetha  
SharmaEssentialsofBusinessCommunication-RajendraPal&J.SKorlahalliSultan  
Chand&Sons



SEMESTERIV

- பிரிஸ்ட் நிகர்நிலை பல்கலைக்கழகம் வல்லம் ,தஞ்சாவூர்  
பாட குறியீடு : 20110AET41

தமிழ்

நான்காம் பருவம்

முதலாம் ஆண்டு (BA , BSC , B.COM , BBA )

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

**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 - 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 : 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 நூர் வளி விசம்பு)

**அலகு . 3 ;**

- 1 . பட்டினப்பாலை - முதல் 105 வரிகள்
- 2 . திருக்குறள் - 1.மருந்து 2.ஊக்கமுடைமை 3.உழவு

**அலகு . 4 : செம்மொழி வரலாறு ;**

( மொழி - விளக்கம் , மொழிக்குடும்பங்கள், உலகச் செம்மொழிகள், இந்தியச் செம்மொழி  
செம்மொழித் தகுதிகள் , வரையறைகள், வாழும் தமிழ் செம்மொழி, தொன்மை , தமிழின்  
செம்மொழி நூல்கள்)

**அலகு . 5 : இலக்கிய வரலாறு**

சங்க இலக்கியங்கள் , பதினெண்கீழ்க்கணக்கு நூல்கள்.

CourseCode	CourseTitle	L	T	P	C
19111SEC41	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

**UNITIV**

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 Workbook-I&II - Jewelcy Jawahar

CourseCode	CourseTitle	L	T	P	C
19111AEC42	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 Tempe  
st

REFERENCES:

EnglishforEnrichment

-

.DevarajEmeraldPublishersSelectedScenesfromShakespeareBookI&II -Emerald  
Publishers



Course Code	Course Title	L	T	P	C
19160SEC43	TOTAL QUALITY MANAGEMENT	5	0	0	3

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.

#### 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.

#### Skill development

#### 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)-Bench marking.

#### 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, 4<sup>th</sup> 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.

<b>Course Code</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC44	COST ACCOUNTING	4	0	0	3

### 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.

### 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.

Employability

### REFERENCES:

Advance Cost Accounting–Jain and Narang–Kalyani Publishing.

Course Code	Course Title	L	T	P	C
19160AEC4 5	RETAIL MANAGEMENT	4	0	0	4

**Objectives:** To gain in-depth knowledge about Retail management practices in Retail Industry.

**Prerequisite:** Students should have a mind set of setting Retail outlets. Students must have knowledge on basic retailing concepts

### 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

#### 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

#### 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

## Employability

### 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-Retailing through the Internet

### REFERENCES:

- Sivakumar, Retail Marketing, Excel Books, First Edition, 2007.
- Ramakrishnan and Y.R. Srinivasan, Indian Retailing Text and Cases, Oxford University Press, 2008.
- Swapna Pradhan, Retail Management-Text and Cases, Tata McGraw Hill, 3rd Edition, 2009.
- Dunne, Retailing, Cengage Learning, 2nd Edition, 2008
- Ramkrishnan and Y.R. Srinivasan, Indian Retailing Text and Cases, Oxford University Press, 2008
- Dr. Jaspreet Kaur, Customer Relationship Management, Kogent solution.

<b>Course Code</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160AEC4 6	INDUSTRIALRELATIONSANDLABOUR LAWS	4	0	0	3

#### 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– Constitutional Framework.

#### UNIT-II

International Labour Movement – International Confederation of Free Trade Unions (ICFTU) – ILO –Origin, history, Objectives and Functions.

#### 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, 1948 – Objects – Provisions relating to health, Workers Compensation Act, 1923 – Objects – Employer's Liability for compensation – Employee's state Insurance Act, 1948 – Objects – Registration of Factories and establishments – The ESI Corporation – Standing Committee – Offences and penalties – Miscellaneous Provisions.

#### UNIT-V

Industrial Disputes Act 1947 – Objects – Authorities for settlement – Lockouts – Lay-Off – Strikes – Retrenchment – Transfer and Closure – Trade Union Act, 1926 – Objects – Registration – Rights and Liabilities of Registered Trade Unions – Procedure – Penalties.

#### Employability

#### REFERENCES:

- Kapoor N.D. – Industrial Laws
- Shukla M.C. – Industrial Laws



CourseCode	CourseTitle	L	T	P	C
19120SEC04 A	GENERALAPTITUDE&PERSONALITY DEVELOPMENT	0	0	2	1

#### SELF MANAGEMENT I

- Self Evaluation • Self Discipline • Self Criticism • Recognition of one's own limits and deficiencies • Independence etc. • Thoughtful & Responsible • Self Awareness

#### SELF MANAGEMENT II

- Identifying one's strengths and weaknesses • Planning & Goal setting • Managing self – emotions, ego, pride.

#### TIME MANAGEMENT CONCEPT

- Attendance, Discipline & Punctuality •

Act in time on commitment • Quality/Productive Time Skill development

#### Verbal Ability:

English grammar, sentence completion, verbal analogies, word groups, instructions, critical reasoning and verbal deduction.

#### NUMERICAL ABILITY:

Numerical computation, Numerical estimation, Numerical reasoning and Data Interpretation.

COURSECODE	COURSE TITLE	L	T	P	C
19111SEC04L	COMMUNICATIVE ENGLISH LAB-IV	0	0	1	1

**AIM:**

- To develop communicative skills

**OBJECTIVE:**

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To improve presentation skill
- To enrich vocabulary

**OUTCOME:**

- Understand grammar
- Develop language and presentation skills

**UNIT-I**

Direct and Indirect

**UNIT-II**

Comprehension

**UNIT-III**

Conversation

**UNIT-IV**

Descriptive Writing

**UNIT-V**

Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception

**Lab Note-** Confusing Words, Word families, Non-English words, Presentation skills, Oral presentation, Conversation from Global software

**Viva**-Presenting a topic

**Exam components**-Theory-50+MCQ online exam-20+Viva-15+Labnote-15=100

**References:**

English Grammar	-Wren and
Martin English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-
Rajendra Pal & J.S. Korlahalli Sultan Chand & Sons Soft skills	-D. Jayacandran D.J Publishers

CourseCode	CourseTitle	L	T	P	C
191ENVTST U	ENVIRONMENTAL STUDIES	2	0	0	2

**UNIT-I:**

The Multidisciplinary Nature of Environmental Studies

**UNIT-II:**

Natural Resources: Renewable and Non-Renewable Resources

**UNIT-III:**

Ecosystems

Skill development

**UNIT-IV:**

Biodiversity and its Conservation

**UNIT-V:**

Environmental Pollution

**UNIT-VI:**

Social Issues and the Environment

**UNIT-VII:**

Human Population and the Environment

**UNIT-VIII:**

Fieldwork

**REFERENCES:**

Environmental Studies – K. Kumaraswamy, A. Alagappa Moses, M. Vasanthy

(Bharathidasan University – Tiruchirappalli)

SEMESTER V

Course Code	Course Title	L	T	P	C
19160SEC51	FINANCIAL MANAGEMENT	6	0	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 THE 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

#### UNIT-V

**Dividend Decision** Theories of Dividend-Determinants of dividend-Dividend Policy - Dividend policies in practice

#### Skill Development

#### 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
- Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.

Course Code	Course Title	L	T	P	C
19160SEC52	SERVICES MARKETING	5	0	0	3

**OBJECTIVES:** To enable students know the various concepts of services marketing. To understand the strategies for managing and marketing of services and devise strategies for marketing services in the liberalized business environment.

### 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 skill 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.

#### 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.

#### Skill development

#### 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 Palmer (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
19160SEC53	PRODUCTION AND OPERATIONS MANAGEMENT	5	0	0	3

**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.

#### 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

Plant Layout: Definition Plant Layout, Objective of plant layout – Types, Principles, Factors influencing plant layout.

#### UNIT-V

Material Handling: Definition of material handling – Importance – Objective – Principles – Types of material handling – Inventory control – Factors affecting inventory control

Employability

#### REFERENCES:

- Operational Management – C. S. V. Murthy (Himalaya Publishing House)
- Production and Operations Management – B. S. GOYEL.
- Production and Operations Management – PANNERSELVAM, Prentice Hall of India
- Material Management – M. M. VARMA.
- Production Management – Saravanavelsumathi

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC54	GLOBAL BUSINESS MANAGEMENT	6	0	0	4

#### OBJECTIVES:

To make students

- Understand the fundamental concepts of international trade
- Comprehend basic principles of MNCs and
- Acquire broad knowledge on Global Liberalization and WTO Agreements.

#### COURSE OUTCOMES

- Use data, predictive modeling, and analysis to recommend strategies to support management decisions in a global context.
- Develop, execute and analyze a comprehensive business plan in alignment with the organization's local and global initiatives or goals.
- Conduct global and domestic business with diverse populations using culturally appropriate methods in compliance with relevant national and international laws, policies, regulations, and ethical practices.
- Assist in the importing and exporting functions of a business.
- Use project management principles, tools, and techniques to define timelines and evaluate project deliverables for all members of cross-functional, intercultural and multidisciplinary teams.
- Apply financial decision making that complies with jurisdictional practices in the operations of global business.
- Integrate leadership theory into practice to drive organizational change while maintaining working relationships and team performance.

#### 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.

#### 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 – Uruguay Round Negotiation – WTO – GATS – TRIMS – TRIPS – Agreement – Dispute settlement under WTO – Tariff Barriers.

#### Employability

#### UNIT-IV

MNC – Meaning – Dominance of MNCs – MNCs and International Trade – Models – MNCs in India.

#### UNIT-V

Globalization of Business – Recent Trends – Implication and Impact – Policy Options – Liberalization and Integration with the Global Economy – Impact of Privatization in India.

#### REFERENCES:

1. Francis Cherunilam: 'International Business' (EEE), PHI – New Delhi – 2004. (Chapters 5, 9, 20, 24 & 26)
3. International Business – By Rakesh Mohan Joshi, Oxford University Press, Chennai.
4. Victor Luis Anthuvan – Issues in Globalization.
5. International Business – By Donald A Ball and others, India Edition, TATA McGraw Hill.
6. International Business – S. Shajahan, Macmillan India Ltd., Chennai.
7. International Business – Justin Paul, PHI Learning Pvt. Ltd. New Delhi.

CourseCode	CourseTitle	L	T	P	C
19160DSE54 A	ADVERTISINGAND SALESMANSHIP	5	0	0	3

**Objective:** To improve the knowledge and competency of advertising and to have the knowledge of salesmanship.

### COURSE OUTCOMES

- Understand the basic concepts of advertisements & the way these 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.

**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.

### 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- Characteristics of a good salesman and sales

### Employability

#### REFERENCES:

- Advertising Principles problems and Cases– Charles. J. Dirkson.
- Advertising management Concept– Manendra Mohan
- Salesmanship- Sathyanarayanan
- Salesmanship and Publicity- J.S.K. Patel

CourseCode	CourseTitle	L	T	P	C
19160DSE54 B	INVESTMENT MANAGEMENT	5	0	0	3

**OBJECTIVE:**

- To enable the students to acquire knowledge of Investment management
- On successful completion of this course, the students should have understood
- Investment avenues Security analysis

**COURSE OUTCOMES**

- Understand different investment alternatives in the market
- Understand how securities are traded in the market
- Be able to analyze and price different securities
- Be able to manage a portfolio
- Understand basics in derivatives

**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 111**



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

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC05 A	PHOTO SHOP	0	0	2	1

1. Design aVisitingcard.
2. Design a Identitycard.
3. Design aletterpadwithLOGO.
4. CreateanadvertisementforNewspaper andPostercreation.
5. Design acalendarwithpictures.
6. Design aMagazine.
7. Createafrontpagefor aMagazine
8. Design aCDCover.

COURSECODE	COURSE TITLE	L	T	P	C
1011SECO51	COMMUNICATIVE ENGLISH I A B V	0	0	1	1

**Aim:**

- To develop communicative skills

**Objective:**

- To understand the degrees of comparison
- To build up a thought
- To write a resume
- To construct a report, agenda and minutes
- To prepare for an interview

**Outcome:**

- Develop communicative skills
- To get a job

**UNIT-1**

Degrees of comparison

**UNIT-II**

Proverb expansion

**UNIT-III**

Resume writing

## **UNIT-IV**

Interview

## **UNIT-V**

Corporateskills-bodylanguage-etiquette-goodmanners-interpersonalskills

**LabNote**-Reportwriting,Resumewriting,  
InterviewfromGlobarenaoftware,Writingagenda,Writingminutes

**Viva**-MockInterview

**Examcomponents**-Theory-50+MCQonlineexam-20+Viva-15+Labnote-15=100

### **References:**

EnglishGrammar

-Wren and

MartinEnglishGrammarandComposition

-RadhakrishnaPillai

TechnicalCommunication

-MeenakshiSharma&SangeethaSharma

EssentialsofBusiness Communication

-RajendraPal&J.SKorlahalliSultanChand&Sons

SEMESTERVI

Course Code	Course Title	L	T	P	C
19160SEC61	BUSINESS POLICY AND STRATEGIC MANAGEMENT	5	0	0	4

**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**

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.

#### 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 – control process, performance. Organisational resource analysis, matching opportunities and resources strategy and values, social responsibilities of managements.

#### Employability

#### UNIT-IV

Stability strategy – Growth – Retrenchment – Turnaround Strategy – Diversification.



## UNIT-V

MergersandAcquisition –Amalgamation–JointVenture–ERP –ERP Package.

### REFERENCES:

- P.SubbaRao– HimalayaPublishingHouse.

- V.P.Michael.
- AZHARKAZMI–Tata McGraw-Hill
- K-Balasubramaniam,S.UshaPriya–GIGOPublication.

Course Code	Course Title	L	T	P	C
19160SEC62	ENTREPRENEURIAL DEVELOPMENT	6	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.

#### 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

Employability

#### 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; Clugh Publications, Allahabad.

- SinerA David: Entrepreneurial Megabooks; JohnWileyand Sons, New York.
- SrivastavaS.B:APracticalGuidetoIndustrialEntrepreneurs;SultanChandandSons,NewDelhi.

Course Code	Course Title	L	T	P	C
19160SEC63	LOGISTICSANDSUPPLYCHAIN MANAGEMENT	5	0	0	4

**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

**Prerequisite:** Students should have transportation and operational process knowledge. Students must have basic documentation in Business.

### 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

#### UNIT I

**INTRODUCTION**-Defining logistics and supply chain management-Growth and Development-Components of supply chain-Importance of supply chain strategies-SCM Performance.

#### UNIT II

**LOGISTICS MANAGEMENT**-Logistics-Functions, Objectives-Management of Materials flow in supply chain-Warehouse and Materials storage-Material Handling-Benchmark in best practices

#### UNIT III

**CUSTOMER RELATIONSHIP MANAGEMENT**-Customer Relationship Management-outbound logistics resource planning and Management-Quick response system in Manufacturing.

Employability

#### UNIT IV

**LOGISTICS AND SUPPLY CHAIN PERFORMANCE** -Management of Inbound logistics-Supply chain cases, Role of a manager in supply chain-Supply chain performance drivers, Value of Supply chain and improvement

#### UNIT V

**CURRENT TRENDS** - Supply chain relationships – Supply chain cost analysis – Issues in Global Supply chain-E Logistics-E SCM-Reverse Logistics-Global Logistics

#### REFERENCES:

1. Bowersox Donald J. Logistics Management-“The integrated supply Process” Tata McGrawhill, 2000.
2. R.P. Mohanty and S.G. Deshmukh, “Supply chain Management”, Biztantra, 2005
3. Coyle et al., The Management of Business Logistics, Thomson Learning, 7th Edition, 2004.
4. Ailawadi CSathish & Rakesh Singh, Logistics Management, PHI, 2005. 3. Bloomberg David

J et al., Logistics, Prentice Hall India, 2005.

5. Pierre David, International Logistics, Biztantra, 2003.

6. Ronald H. Ballou, Business

Logistics and Supply Chain Management, Pearson Education, 5th Edition, 2007

Course Code	Course Title	L	T	P	C
19160DSC64 A	CUSTOMER RELATIONSHIP MANAGEMENT	5	0	0	3

**Objective:** To improve and enhance relationship with customer and Business. To inculcate the habit in to mate relationship with target customer.

### 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:** Students must have the attitude of customer is our business. Students should think that customer is job provider

#### UNIT I

Introduction to Customer Support Product & Customer – Overview-Importance of a Customer- Consumer behaviour

#### UNIT II

Customer support Methodology Customer Centric approach- External Layers Vs Internal Layers  
-Need of Customer Support Methodologies for Customer Support

#### UNIT III

Introduction to ERP Introduction: ERP- An Overview- Enterprise- An Overview- Benefit of ERP - ERP and Related Technologies

Employability

#### UNIT IV

CRMBasicsCRM–Meaning&Definition-DimensionsofCRM-NatureofCRM-GoalsofCRM-Advantages of CRM

#### UNIT V

ImplementationofCRM–A comprehensive model-  
DevelopingCRMvisionandstrategyManagementsupport

#### REFERENCES:

1. Balasubramaniyan,K., EssenceofCustomerRelationshipManagement,learnTechpress
2. ForSugar-CRM&MicrosoftDynamicCRM-Refer Internet
3. KaushikMukerjee–CRM–PHI.
4. M.PeeruMohamed–CRM-Vikas

CourseCode	CourseTitle	L	T	P	C
19160DSC64 B	FINANCAIL SERVICES	5	0	0	3

### OBJECTIVE:

Development of an understanding of the process of interpersonal Communication. Development of students' critical reading and writing skills. Apply appropriate communication skills across settings purposes and audiences. Improve listening and observational skills.

### COURSE OUTCOMES

- To have competence in Oral, Written and visual Communication.
- Demonstrating critical and innovative thinking.
- Communicate ethically.
- Understanding the process of communication and its effect on giving and receiving information.
- Apply effective communication skills in a variety of public and interpersonal settings.

#### UNIT-I

Introduction–FinancialMarket–Meaningandsignificance–FunctionsofFinancialservices–  
Evolution– Regulating Authorities– Features–Constitutions.

#### UNIT-II

MerchantBanking–Meaning–Registration-scope-Functions–IssueManagement–CostofPublic  
Issues – SEBIguidelines on Merchant Banking

#### UNIT-III

MutualFund–Evolution–Types–FinancialRisk–PerformanceMeasures–(Treynor,Sharpe,Jenson)–  
Organization –Advantages–RegulatoryAspects–GrowthofMutualFunds –UTI.

Employability

#### UNIT-IV



Leasing–Evaluation–ClassificationAccountingTreatment–RegulatoryAuthority–Advantages -  
 Hire purchase – Features – Evolution – Sources of Law – Problems in HirepurchaseIndustry–  
 Factoring–Meaning–Mechanism–Types–FinancialAspect–Advantages.

**UNIT–V**

StockMarkets–History–OrganizationandManagementofStock–exchanges–N.S.E–OTCEI–  
 ShareMarket–indices –Investor protection–Credit Rating.

**REFERENCES:**

1. D.JosephAnbarasu –FinancialServices
2. V.K.Boominathan– FinancialServices
3. P.Manoharan– FinancialServices
4. Gnanarjaj–FinancialServices

CourseCode	CourseTitle	L	T	P	C
19117OEC	OPENELECTIVE:MUSHROOMTECHNOLOGY	4	0	0	2

**UNIT-1**

Introduction-history-scope of edible mushroom cultivation-types of edible mushroominIndia-calacybleindica,volvariellavolvacea,pleurotus sp.Agaricusbisporus

**UNIT-II**

Pure culture-preparation of media(PDA and oat meal agar media)sterilization- preparation of testtube slants to store mother culture-culturing of pleurotus mycelium on petriplates-preparation ofmotherspaw in salinebottle andpolypropylenebagsandtheirmultiplication

**UNIT-III**

Cultivationtechnology:infrastructure,substrates(locallyavailable)polythenebag,vessels,inoculation hood-inoculation loop-low cost stove-sieves-cultural rack mushroom unit(Thatchedmouse)-mushroombed preparation-paddystraw, sugarcane trash, maizestraw, bananaleaves.

**Skilldevelopment**

**UNIT-IV**

Storage and nutrition: short term storage-long term storage (Scanning, pickles, papads, drying,storageionsaltsolutions)-

nutrition:proteins,aminoacids,mineralelements,nutrition:carbohydrates-crudefiber content,vitamins

#### UNIT-V

Foodpreparation,typesof foodspreparedfrommushroom- soup,cutlet,omelette,samosa,pickles,curry, research centers-national level and regional level cost benefit ratio-marketing inIndia and abroad-export value

#### REFERENCES:

- 1.Marimuthuetal.,(1991)oystermushrooms,Deptofplantpathology,TNAU,Coimbatore2.Nita Bahl(1988) Handbook ofmushrooms.IIedition.Vol.1&II
3. Paulstamets,J.SandChilton,J.S.(2004).Mushroomcultivator:Apracticalguidetogrowingmushrooms at home.Agarikon press
4. Shu-Tingchang,PhilipG.Miles,Chang,S.T(2004)Mushrooms:cultivation,nutritionalvalue,medicinaleffect andenvironmental impact,2 nd ,CRCpress.
- 5.SwaminathanM.(1990)food nutrition,bappco.TheBangaloreprintingandpublishing coLtd., Banglore.

CourseCode	CourseTitle	L	T	P	C
19120GEC	OPENELECTIVE:WEBTECHNOLOGY	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 markup 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 frontend webpage and connect to the backend databases.

**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 webpage design project – Forms.

Employability

**REFERENCES:**

1. WorldWideWebdesignwith HTML– C.Xavier– TataMcGraw – Hill –2000.
2. Principlesofwebdesign–JoelSklar–Vikaspublishinghouse2001.

CourseCode	CourseTitle	L	T	P	C
19114OEC	OPENELECTIVE:FOODANDADULTERATION	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

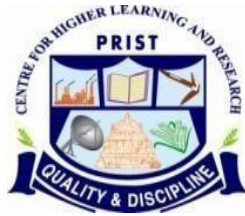
introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti-caking agents, coloring and flavoring substance.

#### 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.

Skill development





**PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY (PRIST)**

**(Institution Deemed to be University U/S 3 of UGC Act 1956)**

**THANJAVUR-613403**



## **MASTER OF BUSINESS ADMINISTRATION**

**CURRICULUM**

**(2019 onwards)**

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 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: UNDER TAKING 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 programme 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: Societal Research

Level 4: Self-actuated

Research Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the MBA 2019 Curriculum, the following Research Skill Based Courses are introduced in the curriculum.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Participation in Societal Research	4
IV	Project Work	12

## BLUEPRINTFORASSESSMENTOFSTUDENT'SPERFORMANCEINRESEARCHLEDEMINARCOURSE

- **Internal Assessment:** **40 Marks**
  - Seminar Report (UG)/Concept Note(PG) : 5X 4=20 Marks
  - Seminar Review Presentation
  - Literature Survey :10Marks
- **Semester Examination:** :10Marks

**60 Marks**

(Essay type Questions set by the concerned resource persons)

## BLUEPRINTFORASSESSMENTOFSTUDENT'SPERFORMANCEINSOCIO TECHNICALPROJECT

- **Continuous Internal Assessment through Reviews:** **40Marks**
  - Review I : 10Marks
  - Review II : 10Marks
  - Review III : 20Marks
- **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: 5Marks
- Introduction: 10Marks
- Discussion: 10Marks
- Review of Literature: 5 Marks
- Presentation: 10Marks

SEMESTER EXAMINATION:

40MARKS

**Total:**

**100Marks**

MASTER OF BUSINESS ADMINISTRATION CURRICULUM (20  
19 ONWARDS)

SL. NO	COURSE CODE	TITLE OF THE COURSE	CREDIT	MARKS
<b>SEMESTER –I</b>				
1.	19260SEC11	Management Concepts	3	100
2.	19260SEC12	Organizational Behaviour	3	100
3.	19260SEC13	Accounting for Managers	4	100
4.	19260SEC14	Economics for Managers	3	100
5.	19260SEC15	Legal Aspects of Business	3	100
6.	19260SEC16	Statistics for Managers	4	100
7.	19220SEC01	Managerial Skill Development-Lab	1	100
8.	19260CRS17	Research Led Seminar	1	100
<b>SEMESTER –II</b>				
9.	19260SEC21	Financial Management	4	100
10.	19260SEC22	Human Resource Management	3	100
11.	19260SEC23	Marketing Management	3	100
12.	19260SEC24	Production & Operations Management	3	100
13.	19260RMC25	Research Methodology	3	100
14.	19260SEC26	Strategic Management	3	100
15.	19220SEC02	Data Analysis Lab	1	100
16.	19260BRC27	Participation in Bounded Research	2	100
<b>SEMESTER –III</b>				
17.	19260SEC31	International Business Environment	3	100
18.	19260SEC32	Operations Research	4	100
19.	19260SRC33	Design/Socio-Technical Project	2	100
20.	19260E-3-	Elective1	3	100
21.	19260E-3-	Elective2	3	100
22.	19260E-3-	Elective3	3	100
23.	19260E-3-	Elective4	3	100

24.	19260E-3-	Elective5	3	100
<b>SEMESTER –IV</b>				
25.	19260SEC41	Entrepreneurial Development	4	100
26.	19260E-4-	Elective6	3	100
27.	19260E-4-	Elective7	3	100
28.	19260PRW44	Project Work	10	300
29.	19260PEE	Programme Exit Exam	2	100
		<b>TOTALCREDITS</b>	<b>90</b>	

## SPECIALIZATIONS

### MARKETING

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
1	19260EA33	Consumer Behaviour	III
2	19260EA34	Integrated Marketing Communication	III
3	19260EA35	Brand Management	III
4	19260EA36	Retail Management	III
5	19260EA37	Sales Management	III
6	19260EA38	Services Marketing	III
7	19260EA39	Industrial Marketing	III
8	19260EA42	Customer Relationship Management	IV
9	19260EA43	International Marketing	IV
10	19260EA44	Rural Marketing	IV

### HUMANRESOURCE

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
1	19260EB33	Knowledge Management	III
2	19260EB34	Organizational Development & Change management	III
3	19260EB35	Performance Management	III
4	19260EB36	Labour Legislations	III
5	19260EB37	Compensation and Reward Management	III
6	19260EB38	Cross Cultural Management	III
7	19260EB39	Conflict and Negotiation Management	III

8	19260EB42	Industrial Relations	IV
9	19260EB43	Training &Development	IV
10	19260EB44	Talent Management	IV

*FINANCE*

<b>S.NO</b>	<b>COURSE CODE</b>	<b>TITLEOFTHECOURSE</b>	<b>SEMESTER</b>
1	19260EC33	Security Analysis and Portfolio Management	III
2	19260EC34	Derivatives Management	III
3	19260EC35	Project Finance	III
4	19260EC36	Financial Services and Institutions	III
5	19260EC37	International Finance	III
6	19260EC38	Insurance and Risk Management	III
7	19260EC39	Corporate Finance	III
8	19260EC42	Micro Finance	IV
9	19260EC43	Strategic Financial Management	IV
10	19260EC44	Merchant Banking and Financial Services	IV

**PRODUCTIONANDOPERATIONS**

<b>S.NO</b>	<b>COURSE CODE</b>	<b>TITLEOFTHECOURSE</b>	<b>SEMESTER</b>
1	19260ED33	Project Management	III
2	19260ED34	Planning and control of operations	III
3	19260ED35	Technology Management	III
4	19260ED36	Logistics Management	III
5	19260ED37	Supply Chain Management	III
6	19260ED38	Business Process Reengineering	III
7	19260ED39	Materials Management	III
8	19260ED42	Maintenance Management	IV
9	19260ED43	Service Operations Management	IV



10	19260ED44	Product Design	IV
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LOGISTICSANDSUPPLYCHAIN

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
1	19260EE33	Purchasing and Procurement Management	III
2	19260EE34	Material Management	III
3	19260EE35	Inventory Management	III
4	19260EE36	Supply Chain Management	III
5	19260EE37	Logistics Management	III
6	19260EE38	Custom House Practice And Legalities	III
7	19260EE39	Export Trade and Documentation	III
8	19260EE42	Quality Management	IV
9	19260EE43	Air Cargo Logistics Management	IV
10	19260EE44	Shipping and Ocean Freight Logistics Management	IV

INTERNATIONALBUSINESS

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
1	19260EF33	International Marketing	III
2	19260EF34	International Human Resource Management	III
3	19260EF35	Cross Cultural Management	III
4	19260EF36	Global Logistics and Supply Chain Management	III
5	19260EF37	International Trade Procedures and Documentation	III
6	19260EF38	International Strategic Management	III

7	19260EF39	Global Business Ethics and Corporate Governance	III
8	19260EF42	Management Of International Developmental Organizations	IV
9	19260EF43	Mergerand Acquisitions	IV
10	19260EF44	International Financial Management	IV

*SYSTEMS*

<b>S.NO</b>	<b>COURSE CODE</b>	<b>TITLEOFTHECOURSE</b>	<b>SEMESTER</b>
1	19260EG33	Software Engineering	III
2	19260EG34	Software Project Management	III
3	19260EG35	Relational Database Management Systems	III
4	19260EG36	E-Business Technology and Management	III
5	19260EG37	Data Warehousing & DataMining	III
6	19260EG38	Knowledge Management	III
7	19260EG39	Enterprise Resource Planning	III
8	19260EG42	Information Storage & Management	IV
9	19260EG43	Cloud Computing	IV
10	19260EG44	Decision Support System And Intelligent Systems	IV

**HOSPITALMANAGEMENT**

<b>S.NO</b>	<b>COURSE CODE</b>	<b>TITLEOFTHECOURSE</b>	<b>SEMESTER</b>
1	19260EH33	Management Of Hospital Services	III
2	19260EH34	Operations Management In HealthCare	III
3	19260EH35	Marketing Management Of Hospital And Health Care Services	III
4	19260EH36	Community Health and Management of National Health Programmes	III
5	19260EH37	Management of Clinical and Super Specialty Services in Hospitals	III

6	19260EH38	Patient Care Management	III
7	19260EH39	Health Related Laws and Ethics	III

8	19260EH42	Medical Tourism	IV
9	19260EH43	Hospital Architecture, Planning, Design and Maintenance	IV
10	19260EH44	Hospital Waste Management	IV

*TOURISM*

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
1	19260EI33	Tourism Principles, Policies and Practices	III
2	19260EI34	Tourism Products of India	III
3	19260EI35	Destination Planning and development	III
4	19260EI36	Travel agency and Tour operations	III
5	19260EI37	Hospitality Management	III
6	19260EI38	Indian culture and Heritage	III
7	19260EI39	Tourism Marketing	III
8	19260EI42	Ecotourism	IV
9	19260EI43	Event Management	IV
10	19260EI44	E-Tourism	IV

**AGRIBUSINESSMANAGEMENT**

S.NO	COURSE CODE	TITLEOFTHECOURSE	SEMESTER
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1	19260EJ33	Agribusiness Environment and Policy	III
2	19260EJ34	Agricultural Marketing Management	III
3	19260EJ35	Farm Business Management	III
4	19260EJ36	Management of Agribusiness Cooperatives	III
5	19260EJ37	Food Retail Management	III

6	19260EJ38	Management of Agricultural Input Marketing	III
7	19260EJ39	Agri Supply Chain Management	III
8	19260EJ42	Agriculture Economics	IV
9	19260EJ43	Agricultural and Micro-Finance	IV
10	19260EJ44	New Trends and Development Agri-Sector	IV



# **SEMESTER -I**

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC11		4	0	0	3

## MANAGEMENT CONCEPTS

**COURSE OBJECTIVE:** To familiarize the student 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.

Skill development

#### **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.

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC12		4	0	0	3

## ORGANIZATIONAL BEHAVIOUR

**COURSE OBJECTIVE:** To provide an overview of 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 III 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 – Effects on work behavior.

### UNIT III GROUP BEHAVIOUR

#### Skill development

**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. Jobsatisfaction – 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

**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.

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC13		4	0	1	4

## ACCOUNTING FOR MANAGERS

**COURSE OBJECTIVE:** To acquaint the students with the fundamental principles of financial, cost & Management Accounting. Enable the students to take decisions using management accounting tools and to expose the students 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 analyse 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–VBudgetingandBudgetarycontrol:BudgetaryControl–MeaningandConcepts-  
Preparationof VariousBudgets,VarianceAnalysis–Material,Labour andOverhead.**

**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.

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC14		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 - Break even 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.

**Employability**

**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.



#### TEXT/REFERENCES

1. Varshney.R.L., andMaheswari,K.L.,ManagerialEconomics.,SultanChand&Sons.
2. D.MMithani.,ManagerialEconomics–TheoryandApplications,Edition2014,Himalaya PublishingHouse.
3. GuptaG.S.,Managerial Economics,TataMcGrawHill.
4. Riggs,J.L.,ManagerialEconomics,McGrawHill.
5. Peterson,HCandW.C.Lewis,ManagerialEconomics,Prentice-HallofIndia.
6. Datt&Sundharam“IndianEconomy”,GauravDutt&AshwiniMahajan.,71<sup>st</sup>EditionSChand

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC15		4	0	0	3

## LEGALASPECTSOFBUSINESS

**COURSEOBJECTIVE:** To createtheknowledgeofLegalperspectiveanditspracticesto improvise thebusiness.

**COURSEOUTCOME:** Legalinsightwillbeestablishedinthebusinesspracticesaccordingto thesituationofchangingenvironment.

**UNIT-I: The Contract Act, 1871** Natureandclassificationofcontracts-Essentialelementsof a valid contract - Offer and Acceptance - Consideration - Capacities of Parties -Provisionsrelating to free consent, void agreements - Provisions relating to performance and discharge ofcontract- Breach of contract-Meaningand remedies.

**UNIT - II: Contract Act, 1872** Contracts of Indemnity - Meaning, nature - Right of IndemnityHolder and Indemnifier- Contracts of Guarantee - Meaning, Nature and Features - Types ofGuarantee - Provisions relating to various types of Guarantee - Agency - Agent and Principal -Creation of Agency - Classification of Agents- Relationship between Principal and Agent -Rights,Duties andLiabilitiesofAgent and Principal– Termination ofAgency

**UNIT - III: Sales of Goods Act, 1930** Contract for Sale of Goods - Meaning - Essentials of aContract of Sale - Formalities of a Contract of sale - Provisions relating to conditions andWarranties - 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,trademarksand designs

**UNIT - IV: The Negotiable Instruments Act, 1881**NegotiableInstruments-Meaning,Characteristics, Types, Parties – Holder and holder in Due Course - Negotiation and Types ofEndorsements- Dishonour of NegotiableInstrument- Noting and Protest-Liability of partiesonNegotiableInstrument.

**UNIT- V: The Companies Act, 1956andTheInformationTechnologyAct, 2000**Company

-Definition,Meaning,FeaturesandTypesofcompanies-Incorporationofacompany-MemorandumofAssociation,ArticlesofAssociationandProspectus-theinformationtechnology act, 2000; Digital Signature - Digital Signature Certificate- Electronic Governance - ElectronicRecords -CertifyingAuthorities-Penalty&Adjudication

### Employability

#### TEXT/REFERENCES

1. ElementsofMercantileLaw –N.D.Kapoor.
2. MercantileLaw–Maheswari&Maheswari.
3. MercantileLaw–S.M.Shukla.
4. Pathak and Akhileshwar, “Legal Aspects for Business”, 3rd Edition, Tata McGraw – HillPublishingCompanyLtd, 2007.
5. Tulsian,“Businesslaw”,2ndEdition,TataMcGraw-HillPublishingCompanyLtd.,2000.
6. Goel,“Businesslaw”,WileyIndiaPvt.Ltd,2007.

SEMESTER	ONE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC16		4	0	1	4

## STATISTICS FOR MANAGERS

**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 Fundamental 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.

### Skill development

**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.

SEMESTER	ONE	NATURE	PRACTICAL	L	P	T	C
COURSECODE		19220SEC01		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.

**COURSEOUTCOME:** 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 expressing 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.

**UNIT I:** Self introduction – News Reading – Story Telling – Etiquettes for Managers – Review of Articles, Movies and Books

**UNIT II:** Role Play – Debate – Group Discussions – Paper Presentation – Mock Interview

**UNIT III:** Corporate Writing, Creative Writing, Report Writing, Preparing Press Notes.

**UNIT IV:** Case Studies – Analyzing and presenting Cases, Poster Making, Framing Advertisements, Slogans, Captions.

**UNIT V:** Use of Computer & Technology (MS Word, Powerpoint) (Using Internet as a tool for effective Management)

**Skill development**



# SEMESTER -II



SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC21		3	0	1	4
<b>FINANCIAL MANAGEMENT</b>							

**COURSE OBJECTIVE::** Facilitate student to understand the operational nuances of a Finance Manager. Comprehend the technique of making decisions related to finance function

**COURSE OUTCOME:** 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 - Costs 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: Payback period; Accounting Rate of Return - DCF Techniques - Net present value, Profitability Index and Internal Rate of Return - Investment appraisal practices in Indian companies.

**Employability**

**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:DividendDecision**ManagementofProfits-MeaningandSignificance-Theoriesof Dividend - Determinants ofdividend - Dividend Policy - Dividend policies in practice - Legalaspects of Dividends– Bonus shares – stock splits.

**TEXT/REFERENCES**

1. M.Y.KhanandP.K.JainFinancialmanagement,Text,ProblemsandcasesTataMcGrawHill, 6th edition, 2011.
2. M.PandeyFinancialManagement,VikasPublishingHousePvt.Ltd.,10thedition,2012.**REFE  
RENCES**
1. AswatDamodaran, Corporate FinanceTheoryandpractice, John Wiley&Sons, 2011.
2. JamesC.Vanhorne–FundamentalssofFinancialManagement–PHILearning,11thEdition,2012.
3. Brigham,Ehrhardt,FinancialManagementTheoryandPractice,12thedition,CengageLearning2010.
4. PrasannaChandra,FinancialManagement,9thedition,TataMcGrawHill,2012.
5. Srivatsava,Mishra,FinancialManagement,OxfordUniversityPress, 2011

SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC22		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 - HR 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 - Kinds 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 Ruvoosveldt (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. Mamoria
6. Human Resources Management – Ashwathappa

SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC23		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

Employability

**UNIT IV** Role of Marketing Communication – Components of Promotion (Advertising, Sales Promotion, Personal Selling, Public Relations – Basic Concepts), Direct Marketing (Direct Mail, Catalogue, Tele Marketing),

**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

**TEXT/REFERENCES**

1. PhilipKotler, KevinLane, AbrahamKoshy- MarketingManagement – A SouthAsianPerspective- Pearson/PrenticeHallIndiaLtd
2. RajanSaxena – MarketingManagement- Tata McGrawHill
3. Ramaswamy& Namakumary- MarketingManagement- GlobalPerspective- IndianContext- MacMillonIndiaLtd

SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE	19260SEC24			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, Job shop, Batch, Continuous, Flow and Mass Production Systems.

### **UNIT-II: PRODUCTION PLANNING AND CONTROL** Production Planning & Control

– Preplanning – Forecasting – 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, 11<sup>th</sup> 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



SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE		19260RMC25		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.

**COURSE 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- 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.

#### Skill development

**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

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
2. Business Research methods, Alan Bryman and Emmabell –  
Oxford University press. chennai. Email: v.anand@oup
3. Research methodology, By R. Panneer Selvam, philearning India PVT Ltd., New Delhi. Email  
: phi@phindia.com
4. Academic writing, A guide for management students and Researchers, By Mathukutty M. Monippal  
Iyand Badrinarayanan Shankar Pawar – [www.sagepublications.com](http://www.sagepublications.com)
5. Research methods Indian Edition By Donald H. Mcburney and Theresa – Cengage (learning. Email:  
sriram.b@cengage.com)

SEMESTER	TWO	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC26		4	0	0	3

## STRATEGIC MANAGEMENT

**COURSE OBJECTIVE:** To provide an integrated view of the functional areas and to acquaint the students with the strategic management process. Focuses to critically examine the management of the entire enterprise from the Top Management viewpoints.

**COURSE OUTCOME:** Create knowledge and understanding of management policies and strategies within a changing context to meet stakeholder interests information systems to learn from failure key tools and techniques for the analysis and design of information systems, including their human and organisational as well as technical aspects.

**UNIT-I INTRODUCTION TO STRATEGIC MANAGEMENT** Strategic Management and Competitiveness- Technology and Technology- Stakeholders in business – Vision, Mission and Purpose- Business definition, Objectives and Goals- Strategic Business Unit (SBU); Functional level strategies- Corporate Governance and Social responsibility

**UNIT-II ENVIRONMENTAL ANALYSIS** The External Environment: Opportunities, Threats, Competition and Competitor Analysis. External Environmental Analysis, Segments of the External Environment, Porter's 5 Forces Model, The internal Environment: Resource, Capabilities, Competencies and Competitive advantages. Analyzing internal organization- Building Core Competencies- Value Chain Analysis, Outsourcing.

**UNIT-III: STRATEGIES** The generic strategic alternatives- Stability, Expansion, Retrenchment and Combination 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 Threat and Opportunity Profile (ETOP)- Organizational Capability Profile- Strategic Advantage Profile - Corporate Portfolio Analysis - SWOT Analysis - GAP Analysis - McKinsey's 7s Framework - GE 9 Cell Model – Distinctive competitiveness - Selection of matrix - Balance Score Card

**UNIT-IV STRATEGY IMPLEMENTATION & EVALUATION** The implementation

process, Resource allocation, Designing organisational structure-Designing Strategic Control Systems- Matching structure and control to strategy-Implementing Strategic change-Politics-Power and Conflict-Techniques of strategic evaluation & control-case study

#### **UNIT-V-STRUCTURE AND CONTROL Structure and Controls with Organizations-**

Organizational Structure and controls, Evolutionary Patterns of strategy and organizational structure. Leadership Implications for Strategy- Entrepreneurial Implications for Strategy –Functional Strategies.

#### **SKILL DEVELOPMENT**

#### **TEXT/REFERENCES**

1. Strategic Management Concepts And Cases, Thompson, Strickland, TMH.
2. Strategic Management An Integrated Approach, Hill, Jones, 6th Edition, Indian Adaptation, Biztantra.
3. Strategic Management Concepts And Cases, David, 12th Edition, PHI.
4. Business Environment For Strategic Management, Aswathappa, HPH

<b>SEMESTER</b>	<b>TWO</b>	<b>NATURE</b>	<b>PRACTICAL</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19220SEC02			<b>0</b>	<b>2</b>	<b>0</b>	<b>1</b>

## **DATA ANALYSIS (MS-EXCELLAB)**

**COURSE OBJECTIVE:** The course aims to understand MS Excel for applying statistical tools.

**COURSE OUTCOME:** Learning Outcome: The learning outcome is that the students 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

### **Skill development**

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 MSEXCEL, 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



<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>CORE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260SEC31		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

<b>INTERNATIONAL BUSINESS ENVIRONMENT</b>
<b>COURSE OBJECTIVE:</b> To familiarize the student to the basic concepts of international business management
<b>COURSE OUTCOME:</b> 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.
<p><b>UNIT-I</b> 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.</p> <p><b>UNIT-II</b> International Economic Institutions-IMF, World Bank, UNCTAD, UNIDO, GATT, WTO-organizational Structure, objectives and functions</p> <p><b>UNIT-III</b> 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.</p> <p style="text-align: center;"><b>Employability</b></p> <p><b>UNIT IV</b> 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&amp;As.</p> <p><b>UNIT-V</b> 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</p>

**TEXT/REFERENCES**

Francis Cherunilam, "International Business Environment", Himalaya Publishing House Mumbai, 4<sup>th</sup> Edition

K. Aswathappa, "Essentials of Business Environment-Text, Cases & Exercises",  
Himalaya Publishing House, Mumbai, 12<sup>th</sup> Revised Edition.

SEMESTER	THREE	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC32		3	0	1	4

## OPERATIONSRESEARCH

**COURSEOBJECTIVE:** To learn the concepts of operations research applied in business decision making using Operations Research Models. To facilitate the student to find out optimal solution for transportation and assignment problems and to empower to equip with the skills of decision making using quantitative techniques

**COURSEOUTCOME:** 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 application of Operation Research in managerial decision-making-Decision-making environments: Decision-making under certainty, uncertainty and risks 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.

**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 fail 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**

**Employability**

**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 KB 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**

SEMESTER	FOUR	NATURE	CORE	L	P	T	C
COURSECODE		19260SEC41		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

### Employability

**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.

SEMESTER	FOUR	NATURE	PROJECT	L	P	T	C
COURSECODE		19260PRW44		0	0	0	10
<b>PROJECTWORK</b>							

# MARKETING



<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260EA33		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **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.

**Employability**

### **UNIT-**

**IV Consumer Decision Making Process:** Consumer Decision making process, Comprehensive model 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

**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. Conceptual Issues In Consumer Behavior Indian Context – S Ramesh

Kumar, Pearson  
5. Consumer Market demographics in India – Edited by S.L. Rao

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EA34			3	0	0	3

## INTEGRATED MARKETING COMMUNICATION

**COURSE OBJECTIVE:** Due to ever increasing business dealing 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 P.R.

**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.

Skill development

**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.

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EA35			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **BRANDMANAGEMENT**

**COURSEOBJECTIVE:** The objective of this course is to introduce students to the basic scope, benefits and types of brands; and understand the steps involved in designing an appropriate brand for the organization.

**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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		10060EAC64		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.

### Employability

**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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>COURSE CODE</b> 100605A65</p> <p><b>UNIT V RETAIL SHOPPER BEHAVIOUR</b> 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.</p>							
<p><b>TEXT/REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. Michael Havy, Baston, Aweitz and Ajay Pandit, Retail Management, Tata Mcgraw Hill, Sixth Edition, 2007</li> <li>2. Ogden, Integrated Retail Management, Biztantra, India, 2008.</li> <li>3. Patrick M. Dunne and Robert Flusch, Retailing, Thomson Learning, 4th Edition 2008.</li> <li>4. Chetan Bajaj, Rajnish Towand Nidhi V. Srivatsava, Retail Management, Oxford University Press, 2007.</li> <li>5. Swapna Pradhan, Retail Management-Text and Cases, Tata McGraw Hill, 3rd Edition, 2009.</li> <li>6. Dunne, Retailing, Cengage Learning, 2nd Edition, 2008</li> <li>7. Ramkrishnan and Y.R. Srinivasan, Indian Retailing Text and Cases, Oxford University Press 2008</li> <li>8. Dr. Jaspreet Kaur, Customer Relationship Management, Kogentsolution.</li> </ol>							



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060EAC6		2	0	0	2

## 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, AIDA 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, Followup. 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

### **EMPLOYABILITY**

**Unit IV** Channel Intermediaries –

Wholesaling and Retailing; Logistics of Distribution; Channel Planning Organisational Patterns in Mar

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>COURSE CODE</b> 100605A67</p> <p>ketingChannels;ManagingMarketingChannels; Marketing Channel Policies and Legal Issues - Warehouse Management - WarehouseFunctions,Processes,Organization and Operations</p> <p><b>Unit V</b> Information System and Channel Management, Assessing Performance of MarketingChannelsincluding salesforce;International MarketingChannels</p>							
<p><b>TEXT/REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. SalesManagement-RichardRstillEdwardW. Cundiff</li> <li>2. Strategiesforselling-GeraldA.Michaelson</li> <li>3. SalesManagementHandbook –ForsythPtrick</li> <li>4. Valueadded selling-TomReilly</li> <li>5. BuildingaWinningSales Team– GiniGraham&amp;Scott</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		100607A68		2	0	0	2

## SERVICES MARKETING

**COURSE OBJECTIVE:** 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.

**COURSE OUTCOME:** 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 Service scape - Internal Marketing, Service-Profit Chain, Emotional labor, Customers' role in service delivery, Customer as a co-producer.

**EMPLOYABILITY**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>COURSE CODE</b> 100605A60</p> <p><b>UNIT IV</b> Positioning of services – Designing service delivery System, Service Channel– Pricing of services, methods– Service marketing triangle– Integrated Service marketing communication</p> <p><b>UNIT V</b> Applications &amp; 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.</p>							
<p><b>TEXT/REFERENCES</b></p> <p><b>SUGGESTED READINGS:</b></p> <ol style="list-style-type: none"> <li>1. Services Marketing- Zeithaml, Bitner, Gremler &amp; Pandit, TMGH, 4th ed.</li> <li>2. Services Marketing- Christopher Lovelock</li> <li>3. Services Marketing- Rampal &amp; Gupta</li> <li>4. Essence of Services Marketing- Ardian Payne</li> <li>5. Services Marketing- Helen Woodruffe</li> </ol>							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EA39		3	0	0	3

## INDUSTRIALMARKETING

**COURSEOBJECTIVE:** The first part deals with industrial marketing and especially on strategcindustry analysis, understanding organizational buying behavior and management of market channels.The second part offers and introduction to major theories and trends within international business.

**COURSEOUTCOME:** 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: &quot;Knowledge ...in line with a masters student in business administration in comparable international studies&quot;. 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- BusinessmarketingandConsumermarketing-Businessproducts-OrganizationalbuyingProcess- ClassificationofIndustrialCustomersandIndustrialProducts,IndustrialMarketingEnvironment

**UnitII**Strategiesforcustomerrelationshipmanagementforbusinessmarkets-Strategicplanning- Relationshipmarketing-Managingbuyer-sellerrelationship-Measuringcustomerprofitability- Methodsofforecastingdemand-ComponentsofBusinessmodels- Strategicresourcesofbusinessmarketing- CustomerSatisfactionManagementandMeasurement, Customer Loyalty

**Unit III** Managing products- Innovation & new product development- Business-to- Businessbrand-Productpositioning- Managementof innovation-StepsinNew productdevelopment-Deliveringeffectivecustomersolutions-Business-servicemarketing- Servicequality-Servicepackages-Product line planning.

### **EMPLOYABILITY**

**Unit IV Marketing Strategies** Industrial Markets - Product, Price, Promotion and Distribution.MarketingResearchforIndustrialProducts-MarketingstrategyforIndustrialFirms- Developing&EvaluatingStrategies- EffectiveimplementationofStrategies.

**Unit V** Managing channels- B2B in ecommerce platform & SCM- Pricing strategies: Businessmarketingchannels-CostsofLogistics-B2Blogisticalmanagement- PricingBusinessproductsacross their life cycle-Competitive pricing tactics - Marketing Communications- advertising&salespromotion -Personal selling-Performancemeasurement.

### **TEXT/REFERENCES**

1. ElectronicCommerceTechnologies&Applications, BhaskarBharat, TMH
2. E-CommerceAnIndian Perspective, JosephP.T., PHI
3. E-Commerce:StrategyTechnologies&Applications, Whiteley, David, TMH
4. IndustrialMarketingManagementM.Govindarajan, VikaspublishingHousePVT Ltd.
5. IndustrialMarketingbyMILIND T.Phadtare-PHILearningPVT Ltd.,

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060EA72		2	0	0	0

## 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's 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 lifetime value – Selection of Profitable customer segments.

**UNIT III CRM STRUCTURES** Elements of CRM – CRM Process – Strategies for Customer acquisition – Retention and Prevention of defection – Models of CRM – CRM road map for business applications.

### **EMPLOYABILITY**

**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

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
<p>Procurement, Partners in Value Creation, Benchmarking Partners, Customer Advocacy Groups, Sponsors, Partners in Value Delivery.</p>							
<p><b>TEXT/REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. G. Shainesh, Jagdish, N. Sheth, Customer Relationships Management Strategic Perspective, Macmillan 2005.</li> <li>2. Alok Kumar et al, Customer Relationship Management: Concepts and applications, Biztantra, 2008</li> <li>3. H. Peeru Mohamed and A. Sahadevan, Customer Relation Management, Vikas Publishing 2005.</li> <li>4. Jim Catheart, The Eight Competencies of Relationship Selling, Macmillan India, 2005.</li> <li>5. Assel, Consumer Behavior, Cengage Learning, 6th Edition.</li> <li>6. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2007.</li> <li>7. Francis Buttle, Customer Relationship Management: Concepts &amp; Tools, Elsevier, 2004.</li> <li>8. Zikmund. Customer Relationship Management, Wiley 2012.</li> <li>9. G. Shainesh, J. Jagdish N Seth. Customer Relationship Management</li> </ol>							



SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060EA74		2	0	0	2

## 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

**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 – Kinds of Documents – Principal Export Documents – Auxiliary documents – Documents in Import Trade – Export Documentation and procedures - Demand Estimation – GDP – Producer consumer target – **Market segmentation.**

### **EMPLOYABILITY**

**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.

**Unit-V IMPLEMENTING GLOBAL MARKETING STRATEGIES** Negotiation with

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
100605A75		customers and selection method, E-Marketing channels organization & controlling of the globalmarketingprogramme.					
<b>TEXT/REFERENCES</b>							
<ol style="list-style-type: none"> <li>1. VarshneyR.L.andBhattacharya,B–InternationalMarketingManagement(SultanChand &amp;Sons)</li> <li>2. PhilipB.CateoranadJohnM.Hess: InternationalMarketing.</li> <li>3. AlexenderC.Stanley:Handbookof InternationalMarketing.</li> <li>4. JohnFayerwearther:InternationalMarketing</li> <li>5. DavidCarson: InternationalMarketing</li> <li>6. PhilipKotler:MarketingManagement</li> </ol>							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060E A76		2	0	0	0

## RURAL MARKETING

**COURSE OBJECTIVE:** The objective of this course is to explore the student to Rural Marketing environment 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:** 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 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 lifecycle 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-

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
<p>CRM &amp; e-CRM in Rural Marketing- Advanced Practices in Rural Marketing- Social Marketing- Network Marketing- Green Marketing</p>							
<p><b>TEXT/REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. Badi &amp; Badi: Rural Marketing, HPH.</li> <li>2. Rural Marketing– Dogra, Ghuman– TMH</li> <li>3. Rural Marketing– K. Ramakrishnan– Pearson</li> <li>4. Rural Marketing– Kashyap, Raut– Biztantra</li> <li>5. Rural Marketing– T.P. Gopaldaswamy– Vikas</li> </ol>							



# **HUMAN RESOURCES**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB33		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.

### **EMPLOYABILITY**

**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.

**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



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EB34			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.

**SKILL DEVELOPMENT**

**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.

**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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EB35			3	0	0	3

**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 Score card 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. "Micael Armstrong & Angela Baron", Performance Management, Jaico Publishing, 2007.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB36		3	0	0	3

**SUBJECTTITLE:LABOURLEGISLATIONS**

**OBJECTIVE:** This course will help the student to get exposure on Industrial Law. Understandtherelationsshipbetweentheemployee,employer,unionandgovernmentandtohaveawar enessof various industrial laws relatingtoemployees.

**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.

**UNITI**

FactoriesAct,1948-IndustrialDisputeAct,1947

**UNITII**

IndustrialEmployment(StandingOrder)Act,1946 -  
EmployeeProvidentFund&MiscellaneousAct, 1952-TradeUnion Act, 1926

**UNITIII**

PaymentofWagesAct,1936-MinimumWagesAct,1948-EmployeeStateInsuranceAct,1948

**UNITIV**

Paymentof BonusAct,1965-PaymentofGratuityAct,1972

**UNITV**

Workmen Compensation Act, 1923- Maternity Benefit Act, 1961- The Apprentice Act,

1961Skilldevelopment

References:

1. N.D.Kapoor(2006),Industrial Law,Himalayapublishers
2. S.C.Srivastava(2009),IndustrialRelationsandLabourLaws,Vikas

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB88		3	0	0	3

**SUBJECTTITLE:COMPENSATION&REWARDMANAGEMENT**

**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.

**UNITI:**

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.

**UNITII:**

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.

**UNITIII:**

Conventional reward methods and their inadequacies. Developing reward strategy – skill based pay, broad banding, 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.

**SKILL DEVELOPMENT**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB89		3	0	0	3
<p><b>UNITIV:</b></p> <p>Profitsharing,paymentofbonus.UnderstandingDifferentComponentsofCompensationsPackages like Fringe Benefits, Incentives and Retirement Plans, Compensation Practices ofMultinationalCorporationsandStrategicCompensationSystems.Understandingtoolsindesigning ,improvingand implementingcompensation packages</p> <p><b>UNITV:</b></p> <p>Law relating to payment of wages and bonus in India. Statutory Provisions Governing DifferentComponents of Reward Systems- Working of Different Institutions Related to Reward SystemlikeWageBoards,PayCommissions,Role oftradeunions incompensation management.</p> <p><b>SUGGESTEDREADINGS:</b></p> <ol style="list-style-type: none"> <li>1. Milkovich,Compensation,TataMcGraw-HillPublishingCompanyLtd.,NewDelhi,2008.</li> <li>2. B.D.Singh,CompensationandRewardManagement,ExcelBooks,New Delhi,2006.</li> <li>3. Hendorson,Richard, I:CompensationManagement:RewardingPerformance,PHI</li> <li>4. Henderson,CompensationManagementinaKnowledgeBasedWorld,PearsonEducation,New Delhi, 9<sup>th</sup>Edition.</li> </ol>							



## **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 Levels 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.

### **SKILL DEVELOPMENT**

**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 -

Crosscultural Dimension, 3/e, Blackwell, 2005.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB39		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 conflict 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

**UNITIV:**

Negotiations: meaning, definition and importance of negotiation, concept of bargaining and exchange, types of bargain. Approaches towards effective negotiation - Negotiation process

-Negotiations as an approach to conflict management.

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**UNITV:**

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. Barbara Corvete, Conflict Management, Pearson Education.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB42		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 II** 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 III** 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 IIII** 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

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB43		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 students 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.

**EMPLOYABILITY**

**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.

**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



SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EB44		3	0	0	3

**SUBJECTTITLE:TALENTMANAGEMENT**

**OBJECTIVE:**ThiscoursewillhelpestudenttogetexposureonTalentmanagement.Understand the how to acquire talent employees and how to retain such employees in theorganizationfor effectiveperformance and achievement ofgoals.

**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

**Unit1:IntroductiontoTalentManagement:**

Overview,History,ScopeandNeedofTalentManagement,SourceofTalentManagement,ToolsforManaging TalentRoleofHRinTalentManagement,Roleofthe HRManager,TalentManagementProcess

**Unit 2: Building Blocks for Talent Management:**E, Talent Management System , Effective TalentManagement System, Building Blocks of Effective Talent Management System, Critical Success FactorstoCreateTalentManagement System, KeyElementsofTalentManagement System.

**Unit 3: Approaches to Talent Management:**Developing a Talent Management Strategy, MappingBusinessStrategiesandTalentManagementStrategiesTalentManagementandOrganisationalEnvir onment - ShapingTalent Planningand DevelopingValues, PromotingEthical Behaviour

**Unit4:TalentPlanning,Acquisition,EngagementandRetention:**TalentPlanning,ObjectivesofTalentPlan ning,StepsinStrategicTalentPlanning, **TalentAcquisition**, RecruitingProcess, **TalentEngagement and Retention**, Employee Engagement and Retention, Improving Employee

**EMPLOYABILITY**

**RetentionUnit5:CompensationandrewardstrategiesforEffectiveTalentManagement:**SustainableTale ntManagementandRewardModel,StrategicCompensationplanforTalentEngagement, **TalentManagement andCorporateRestructuring;**CorporateReconstruction,TimingtheCorporateReconstruction,Organisatio

nalIssuesandTalentManagementChallenges



## 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

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EC33			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 II 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 investor ratios.

Employability

**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.

**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:PortfolioManagement**

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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EC34		3	0	0	3

**SUBJECTTITLE:DERIVATIVESMANAGEMENT**

**OBJECTIVE:**

To give an in-depth knowledge of the functioning of derivative 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 derivativemarket.

**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 .

**Skill development**

**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.

**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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EC35			3	0	0	3

**SUBJECTTITLE:PROJECTFINANCE**

**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

**UNITI:**

**Basics of Project Finance:** Characteristic and major elements of Projects, Project Planning and Control, -Macroeconomic assumptions-project costs and funding

**UNITII:**

**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

**UNITIII:**

**Project Risk Management:** Project Risk-Identification–Types of Project Risks- Risk Analysis and Transfer -understanding risk measurement techniques.

Employability

**UNITIV:**

**Contract Management:** Introduction – Preparation of Tender - Initial evaluation of Tender - Preparation of promoter's bids - project conditions - Incentives and Penalties - Legal Aspects and agreements.

**UNITV:**

**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



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EC36		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 I 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

**EMPLOYABILITY**

**UNIT – IV: International Market and Financial Services** International Financial Institutions

- International Monetary Fund, Asian Development Bank, World Bank. International FinancialMarket,International Financial Assets and Services

**UNIT – V: Credit Rating:** Credit Rating system – Growth factors CRISIL Ratings for shortterminstruments Credit ratingprocess

**SUGGESTED READINGS:**

1. FinancialServicesByDr.S. GurusamyTMH.
2. FinancialServices,ByNaliniPRAVATRIPATHY,PHIlearningPVTltd.,
3. Financial markets, Institutions & Services by NK Gupta and Monika Chopra –Ane booksPvtLtd.,www.anebooks.com
4. FinancialservicesM. YKhan, TMH.
5. Financialmarketsand InstitutionsbyJeffMadura, IndiaEdition,Cengagelearning.
6. Financialservices andsystemByK.SasidharanandAlexK.Mathews, TMH.
7. FinancialServicesS.Mohanand R.Elangovan, ByDeep andDeep publication.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
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<b>COURSECODE</b>	19260EC37	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>SUBJECTTITLE:INTERNATIONALFINANCE</b>					
<b>OBJECTIVE:</b>					
<p>To give the students an overall view of the international financial system – instruments and markets.</p> <p><b>COURSE OUTCOME :</b> 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 efficiently and effectively.</p> <p>Students will also understand &amp; manage the risks that MNCs have to deal with.</p>					
<b>Unit I</b>					
<p>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</p>					
<b>Unit II</b>					
<p>Fundamentals of Foreign Exchange – Parity theory and conditions – Factors affecting determination of Exchange rate – Various exchange rate types.</p>					
<b>Unit III</b>					
<p>Exposure and Risk Management - hedging – speculation – arbitrage - internal and external techniques of hedging – derivatives – meaning – significance – types.</p>					
<b>EMPLOYABILITY</b>					
<b>Unit IV</b>					
<p>Regulatory Framework for International Finance - Short term financial management in a global set-up – treasury functions – International Taxation – Double Taxation Avoidance Agreement</p>					
<b>Unit V</b>					
<p>Global capital Markets: Issues, investors, intermediaries. Disintermediation, Deregulation, Securitization</p>					

tion, 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. G. 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

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EC38			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:INSURANCEANDRISKMANAGEMENT**

**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.

**EMPLOYABILITY**

**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.

### **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: Insurance and Risk Management, 1st edition, Himalaya Publishing House.
2. DR.P.K.GUPTA: Fundamentals of Insurance, 1st edition, Himalaya Publishing House.
3. C.Gopala Krishnan: Insurance Principles & Practice, Sterling Publishers Pvt.Ltd., New Delhi.
4. George G.R.Lucas, Ralph H. Wherry: INSURANCE, Principles and Coverages, U.S.A.
5. Prof.K.S.N.Murthy and K. V.S.Sarma: Modern Law of Insurance in India, N.M.Tripathi Pvt.Ltd., Bombay.
6. P.S.Palande, R.S.Shah, M.L.Lunawat: Insurance in India, Sage Publications, New Delhi.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		100605C20		2	0	0	2

**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 inter corporate 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.

**EMPLOYABILITY**

**UNIT IV FINANCING DECISION**

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
CORPORATE FINANCE		100605030					
<p>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.</p>							
<p><b>UNIT V CORPORATE GOVERNANCE</b></p> <p>Corporate Governance - SEBI Guidelines- Corporate Disasters and Ethics- Corporate Social Responsibility- Stakeholders and Ethics- Ethics, Managers and Professionalism.</p>							
<p><b>TEXTBOOKS</b></p> <ol style="list-style-type: none"> <li>1. Richard A. Brealey, Stewart C. Myers and Mohanthy, Principles of Corporate Finance, Tata McGraw Hill, 9th Edition, 2011</li> <li>2. I.M. Pandey, Financial Management, Vikas Publishing House Pvt., Ltd., 12th Edition, 2012.</li> </ol>							
<p><b>REFERENCES</b></p> <ol style="list-style-type: none"> <li>1. Brigham and Ehrhardt, Corporate Finance- A focused Approach, Cengage Learning, 2nd Edition, 2011.</li> <li>2. M. Y Khan, Indian Financial System, Tata McGraw Hill, 6th Edition, 2011</li> <li>3. Smart, Megginson, and Gitman, Corporate Finance, 2nd Edition, 2011.</li> <li>4. Krishnamurthy and Viswanathan, Advanced Corporate Finance, PHI Learning, 2011.</li> <li>5. Website of SEBI</li> </ol>							



<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EC114			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECT TITLE: MICROFINANCE**

Objectives: To enable the students to understand the principles, practices and application in Micro Finance.

**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** Introduction: Evolution: Impact and Importance: Micro Financial Services: Steps Initiated in Development of Micro finance

**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

**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. Micro finance 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 hand book-by Jonnaledgerwood – E book
4. Commercial banks in microfinance-by Malcolm Harper and Sukhwindersingharora – Teri Press 2005.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260EC115		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EC116		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.

**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 Framework- Merger as a Capital Budgeting Decision- Legal and Tax Aspects- Post Merger Integration Issue,

**UNIT III** Acquisition/ Take over Codes- Techniques – Defensive Strategies- Cross Boarder 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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE Reference Books		19260EC117		3	0	0	3
<p>1. Sharplin, 'Strategic Management, McGraw Hill.</p> <p>2. Weston J. Fred &amp; E. F. Brigham, 'Managerial Finance', Drydon Press</p> <p>3. James C. Van Horne, 'Financial Management and Policy', Prentice Hall of India</p> <p>4. M. Y. Khan, 'Financial Services', Tata McGraw Hill-3rd Edition</p> <p>5. Richard A. Brealey and Stewart C. Myers, 'Principles of Corporate Finance', Tata McGraw Hill.</p> <p>6. Pradip M. Khandwalla, 'Innovative Corporate Turnarounds', Saga Publications</p> <p>7. G. P. Jakhotiya, 'Strategic Financial Management', Vikas Publications</p>							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		100605EC119		2	0	0	0

**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.

**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.

**EMPLOYABILITY**

**UNIT IV FUND BASED FINANCIAL SERVICES**

Leasing and Hire Purchasing – Basics of Leasing and Hire purchasing – Financial Evaluation.

**UNIT V OTHER FUND BASED FINANCIAL SERVICES**

Consumer Credit – Credit Cards – Real Estate Financing – Bills Discounting – factoring and Forfaiting – Venture Capital.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
<b>COURSE CODE</b>							
103605C110							
<b>TEXTBOOKS</b>							
1. M. Y. Khan, Financial Services, Tata McGraw-Hill, 12th Edition, 2012							
2. Nalini Prava Tripathy, Financial Services, PHI Learning, 2011.							
<b>REFERENCES:</b>							
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.							
5. Website of SEBI							

# **PRODUCTION & OPERATIONS**

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260ED33			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:PROJECTMANAGEMENT**

**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.

**Employability**

## **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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260ED34		3	0	0	3

**SUBJECTTITLE:PLANNING&CONTROLOFOPERATIONS**

**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.

## EMPLOYABILITY

### 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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		19260ED35		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

- o Apply Measurement And Analytical Tools To Increase The Quality Of Products And/Or Services
- o Provide Leadership, Guidance, And Assistance To Coworkers When Implementing Changes
- o 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

## **EMPLOYABILITY**

## **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.

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260ED36			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:LOGISTICSMANAGEMENT**

**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:IntroductiontoLogisticsandCompetitiveStrategy**

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:WarehousingandMaterialsHandling**

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:TransportationandPackaging**

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 J et al., *Logistics*, Prentice Hall India, 2005.



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260ED37			3	0	0	3

**SUBJECT TITLE: SUPPLY CHAIN MANAGEMENT**

**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.

**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

**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: Planning Demand, Inventory And Supply**

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: Current Trends**

E-Business – Framework and Role of Supply Chain in e-Business and B2B Practices. Supply Chain IT Framework. Internal Supply chain management. Fundamentals of Transaction Management. Supply Chain in IT Practice. Supplier Relationship Management. Information Systems Development. Packages in Supply Chain – eSRM, eLRM, eSCM. Supply Base Management.

### **SUGGESTED READINGS:**

1. Sunil Chopra and Peter Meindi, Supply Chain Management – Strategy Planning and Operation, Pearson Education, Third Indian Reprint, 2004.
2. Monczka et al., Purchasing and Supply Chain Management, Thomson Learning, Second edition, Second Reprint, 2002.
3. Shapiro Jeremy F, Modeling the Supply Chain, 2nd Edition, Thomson Learning, 2002.
4. Janat Shah, Supply Chain Management Text and Cases, Pearson 2009
5. RPMohanty and SG Deshmukh, Supply Chain Management Theory and Practices, Biztantra, 2009.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	10260ED122			2	0	0	2

**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**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	19260ED122			2	0	0	2

**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

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
COURSE CODE	10260ED124			2	0	0	2

**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,.

**Skill development**

**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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
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Referencebooks

1. J.R.TonyArnold&StephenN.Chapman,IntroductiontoMaterialsManagement,PearsonEducation Inc, 2001.
2. P.Gopalakrishnan,PurchasingandMaterialsManagement,TataMcGrawHillPublishingCompany Limited, NewDelhi, 2001.
3. P.Gopalakrishnan&M.Sundaresan,MaterialManagementanIntegratedApproach,Prentice –Halof IndiaPrivate Limited,NewDelhi,2001.
4. A.K.Datta,MaterialsManagement,InventoryControlandLogistics,JaicoPublishinghouse,Mumbai, 2001.
5. A.K. Datta, Materials Management Procedures, Text and Cases, Prentice- Hall of India PrivateLimited,NewDelhi, 2001.
6. P.Gopalakrishnan&A.K.Banergi,MaintenanceandSparePartsManagement,PrenticeHalof India PrivateLimited,New Delhi, 2001

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260ED42			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECT TITLE: MAINTENANCE MANAGEMENT**

**OBJECTIVE:**

To enable the student to understand the principles, practices and applications in Maintenance Management.

**COURSE OUTCOME**

To present modern basic maintenance theory, especially related to industrial challenges within terminology, 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 management- Total Productive Management –Contract maintenance – Breakdown history and other maintenance records**

**SKILL DEVELOPMENT**

**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. MaintenanceandsparesPartsmanagement–PGopalakrishnan  
&AKBanerji.PrenticeHall ofIndia, 2007
2. IndustrialEngineeringandManagement-OPKhanna.Dhanpat Rai&Sons,2008



SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260ED43		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.

**SKILL DEVELOPMENT**

**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, News vendor Model; Managing Waiting Lines – Queuing systems, psychology of waiting; Managing for growth – expansion strategies, franchising, globalization.

**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, 2<sup>nd</sup> Edition, 2005.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260ED44		3	0	0	3

<b>SUBJECT TITLE: PRODUCT DESIGN</b>
<p><b>OBJECTIVE:</b></p> <p>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.</p> <p><b>COURSE OUTCOME</b> Use the Product Design and Development Process, as a means to manage the development of an idea from concept through to production.</p> <p>Employ research and analysis methodologies as it pertains to the product design process, meaning, and user experience.</p> <p>Apply creative process techniques in synthesizing information, problem-solving and critical thinking.</p>
<p><b>UNIT I INTRODUCTION:</b> 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.</p> <p><b>UNIT II PRODUCT PLANNING:</b> Product Planning Process – Steps. Opportunity identification – breakdown structure – product development charter. Product Life Cycle. Technology Life Cycle</p> <p>- Understanding Customer Needs - Disruptive Technologies- Product Specification - Concept Generation – Activity-Steps-Techniques.</p> <p><b>UNIT III PRODUCT CONCEPT</b> Selection – Importance, Methodology, concept Screening, Concept Scoring. Concept Testing. Product Architecture- Definition, Modularity, implication, Establishment, Delayed Differentiation, Platform Planning.</p> <p><b>UNIT IV INDUSTRIAL DESIGN AND DESIGN TOOLS</b> 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.</p> <p><b>SKILL DEVELOPMENT</b></p>

**UNIT V PATENTS** Defining Intellectual Property and Patents, Patent Searches and Application, Patent Ownership and Transfer, Patent Infringement, New Developments and International Patent Law.

**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  
SUPPLYCHAIN  
MANAGEMENT

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EE33			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 & its 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.

**Employability**

**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.

**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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EE34		3	0	0	3
<b>SUBJECTTITLE:MATERIALMANAGEMENT</b>							
<b>OBJECTIVE:</b>							
<p>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.</p> <p><b>COURSE OUTCOME</b> 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.</p>							
<p><b>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.</b></p> <p><b>UNIT II: Material planning:</b>  objectives, material requirement planning, manufacturing resource planning, JIT production planning, strategic material planning, material control: acceptance, sampling, inspection, make or buy decisions, economic analysis, breakeven analysis, breakeven point theory, whether to add or drop a product line, product explosion.</p> <p><b>UNIT III: Purchasing:</b> 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.</p> <p><b>EMPLOYABILITY</b></p> <p><b>UNIT IV: Cost reduction:</b> cost control / 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.</p> <p><b>UNIT V: Inventory Management:</b> Stages; Selective Control; Demand Forecasting; Lead time; Safety Stock; Fixed Quantity Reorder System; Fixed Period Reorder System; Inventory Valuation</p>							



n. 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

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EE35			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:INVENTORYMANAGEMENT**

**OBJECTIVE:**

Theobjectiveofthismoduleistoprovidethestudentwithagoodknowledgeoncorporatebusinesscommunication channel, hierarchyand thereport writingmethodologies.

**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.

**UnitIInventory–InventoryManagement-InventoryControl-Importance&ScopeofInventory Control - Types of Inventory - Costs Associated with Inventory – Organizational setup for inventorymanagement.**

Unit II Selective Inventory Control - Economic Order Quantity - Safety Stocks - InventoryManagement Systems- ForecastingTechniques-Material RequirementPlanningandexecution

–RatioAnalysison Inventory-ProfitMargin.

**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 MakeOr BuyDecisions incontext of corecompetency.**

**EMPLOYABILITY**

Unit IV Purpose of Inventory - Goods – Types of Goods - Finished Goods Inventories - GeneralManagementofInventory– Stocks– Types ofStocks–Trackingthe PaperLife.

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 LNarasimhan, 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.

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EE36			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE: SUPPLYCHAINMANAGEMENT**

**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.

**Employability**

**SUGGESTED READINGS:**

1. SupplyChainLogisticsManagement-Bowersox,Closs&Cooper–McGraw-Hill,2ndIndian ed.
2. WorldClassSupplyManagement -Burt,Dobbler, Starling,TMGH, 7thed.
3. DesigningandManagingthesupplychain-DavidSimchi,Levi&PhilipKaminski,McGraw-HillCompaniesInc., 2000.
4. Y.NarahariandS.Biswas. SupplyChainManagement:Models andDecisionMaking.
5. RamGaneshan andTerryP.Harrison.AnIntroductiontoSupplyChainManagement.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		LOGGEE151		3	0	0	3

**SUBJECT TITLE: LOGISTICS MANAGEMENT**

**OBJECTIVE:**

The course outlines the historical background of Logistics Management. It is considered to prepare students to acquire knowledge and skills that lead them to fill management and analysis in positions that will enable them to focus on the processes and systems of Logistics Management.

**COURSE OUTCOMES**

Learn to logistics trends

Know the third, fourth and fifth party logistics

Explain the reverse logistics concept

Know the relationship between logistics and supply chain management

Know the global logistics concepts

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.

UNIT IV Transport Functionality, Principles and Participants- Transportation Service- Transportation Economic and Pricing -Transport Administration – Documentation.

**EMPLOYABILITY**

UNIT V Packaging Perspectives - Packaging For Materials Handling Efficiency – Principles of Material Handling System-Materials Handling Equipments– Safety Issues.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<b>SUGGESTED READINGS:</b>							
<ol style="list-style-type: none"> <li>1. Harrison, A. and Rvan Hoek (2005). Logistics Management and Strategy (2nd Edition) Prentice Hall.</li> <li>2. Muller, M. (2003), Essentials of inventory management, American Management Association, NY 10019</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<b>SUBJECT TITLE: CUSTOM HOUSE PRACTICE AND LEGALITIES</b>							
<b>OBJECTIVE:</b>							
<p>The subject deals with the business transaction with the Customs and Central Excise for successfully executing an Import or Export transaction. This deals 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.</p> <p><b>COURSE OUTCOME</b> 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</p>							
<b>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.</b>							
<b>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 - Ex-bonding.</b>							
<b>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.</b>							
<b>SKILL DEVELOPMENT</b>							
<b>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 .</b>							
<b>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- Drawbacks and Duties- Support of CHA to Importers and Exporters.</b>							
<b>SUGGESTED READINGS:</b>							
1. Hand Book of Procedure of Exim Policy 1997-2002.							



<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EE39			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:EXPORTTRADEANDDOCUMENTATION**

**OBJECTIVE:**

The objective of this module is to provide the students with a good knowledge on Export trade,types of trades, formalities for 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 – ConfidentialityandNDA.

**Unit II**ExportSales–SellingandPurchasing- Consignment–Leases–Marine andAirCausality Insurances - Export Finance - Forex - Major currencies, Exchange rates, relations &impact- Export costingandpricing&Incoterms–ExportLicense –Import License.

**UnitIII**ExportPackaging-Preparationofpreshipmentdocumentation–MethodsofTransportation – Country of Origin Marking- Inspection of Export consignment - Export byPost,Road, Air&Sea- ClaimingforExport benefits and Dutydrawbacks.

**Employability**

**Unit IV** Shipment & Shipping documents - Complicated problems in shipments & negotiationof shipping documentations - Corporate marketing strategies - 100% EOU & Free trade zone - DeemedExport –IsolatedSales Transactions.

**UnitV**Actsforexport/import-Commencement-CustomsFormalities-ExportDocumentation - Export of Services - Export of Excisable Goods - Import Documentation -Clearance - 100% export oriented units - customs house agents - import of different products - import/exportincentives-import licenses etc.

**SUGGESTED READINGS:**

1. Export and Import Procedures and Documentations – Thomas E Johnson and Donna LBade–4th Edition.
2. ExportImportProcedures-Documentationand Logistics,Publisher:NewAgeInternational,ShriC Rama Gopal, Chartered Accountant.
3. ExportImportManagement,JustinPaul&RajivAserkar.
4. ExportManagement, PKKhurana

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EE42			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:QUALITYMANAGEMENT**

**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, Contributions 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. Lidsay, The Management and Control of Quality, Thomson Learning, 5<sup>th</sup> edition, 2002.
3. Narayana V and N. S. 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

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060EE159		3	0	0	3

**SUBJECT TITLE: AIR CARGO LOGISTICS MANAGEMENT**

**OBJECTIVE:**

The objective of this module is to provide the students with a good knowledge of air 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**

1. Understand concept of freight forwarding and air cargo
2. Understand the process involved in the air cargo management
3. Quote the rates for transfer of 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 firefighting-Industry regulations- Future of the Industry.

**Unit II** Introduction to Air Cargo: Aviation and airline terminology - IATA areas - Country – Currency– Airlines- Aircraft layout- 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..

**Unit IV** Advices – Booking - SLI – Labeling – Volume/ Weight Ratio – Shipment Planning - TACT – Air Cargo Rates and Charges - Cargo operations- Cargo Operations process- Customs clearance.

**EMPLOYABILITY**

**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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
<b>SUGGESTED READINGS:</b>							
1. Airtransport 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. Fundamentals of air transport management by P.S. Senguttavan.							
8. Oxford ATLAS - OXFORD PUBLISHING							
9. Aviation century: wings of change - A global survey - Ratandeepsingh-jain book							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
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**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.

**EMPLOYABILITY**

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.

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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
<b>SUGGESTED READINGS:</b>							
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 Freight and Chartering by Cyril Frederick Hardy Cufley (Adlard Coles Nautical)							
7. Logistics and Distribution Management by Alan Rushton, Phil Croucher & Peter Baker (CILT)							



# **INTERNATIONAL BUSINESS**

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
COURSE CODE		10060EE162		2	0	0	2

<b>SUBJECT TITLE: INTERNATIONAL MARKETING</b>
<p><b>Objectives:</b> To understand the principles &amp; concepts in Marketing, to provide the knowledge of marketing management in the international perspective to develop marketing strategies for the dynamic international markets.</p> <p><b>COURSE OUTCOME</b></p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Demonstrate interactive communications skills</li> <li><input type="checkbox"/> Demonstrate use of information technology</li> <li><input type="checkbox"/> Obtain an understanding of the globalization context for business</li> <li><input type="checkbox"/> Apply critical thinking skills to complex business problems</li> <li><input type="checkbox"/> Be able to use analytic skills in addressing business problems</li> </ul>
<p><b>Unit1:</b> 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.</p>
<p><b>Unit2:</b> 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.</p>
<p><b>Unit 3:</b> International product management: International product positioning, Product saturation Levels in global Market, International product lifecycle, Geographic Expansion Strategic Alternatives. New products in International Marketing, Product and culture, brands in International Market.</p>
<p><b>Unit4:</b> 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.</p>

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>Unit 5:</b> 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.</p> <p style="text-align: center;"><b>Skill development</b></p>							
<p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Philip Kotler, (2010), <i>Marketing Management - The South Asian Perspective</i>, Pearson</li> <li>2. Warren J. Keegan (2010): <i>Global Marketing Management</i>, Pearson Education</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1) Svend Hollensen (2010): <i>Global Marketing: A Decision-Oriented Approach - 3rd Edition</i>, Pearson Education.</li> <li>2) Ramasamy, Namakumari (2010) <i>Marketing Management</i>, McMillan Publishers</li> <li>3) Saxena: <b>Marketing Management (Tata McGraw-Hill)</b></li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260EE165		3	0	0	3

**SUBJECT TITLE: INTERNATIONAL HUMAN RESOURCE MANAGEMENT**

**Objectives:** To provide insight from International Human Resource Management (IHRM) to give an overview and the practical implications of operating across national borders in the pursuit of core strategic competences, the management of global organizational values and culture, and the competition for talent.

**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.

**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 Caveat 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- Offshore sourcing- 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.

**Unit-5:** Global workforce performance Management: Performing Management Process- Important consideration for Global Performance Management- Planning and Implementing Global Performance Appraisal-

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
10060EE166		CompensationforaGlobalworkforce- ManagingCompensationonaglobalScale:FundamentalPractices- KeycompensationforExpatriates,HCNsandTNCsGlobalEmployeeRelations-currentERissues-Influence ofMNCs andUnion on GlobalER.					
<b>EMPLOYABILITY</b>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EF97		3	0	0	3
<p><b>References:</b></p> <ol style="list-style-type: none"> <li>1. CharlesMVanceandYongsunpaik,ManagingGlobalworkforce,PHI,2009.</li> <li>2. MarkE.Mendenhall,GaryR.Oddou,GunterK.Stahl,ReadingandCasesinInternational</li> <li>3. HumanResourceManagement,Routledge, FourthEdition,2007.</li> <li>4. TonyEdwardsandChrisRees:InternationalHumanResourceManagement,Pearson,2009.</li> </ol> <ol style="list-style-type: none"> <li>1. Bhatia S.K. 2005. <i>International Human Resource Management: A Global Perspective:ractices and Strategies for Competitive Success</i>, Deep and Deep Book Publishers, NewDelhi,</li> <li>2. Dessler, G. 2005 . <i>Human Resource Management</i> (10th Ed.), Prentice Hall PublishingCompanyLimited,</li> </ol>							

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
COURSE CODE		10260EE120		2	0	0	2

**SUBJECT TITLE: CROSS CULTURAL MANAGEMENT**

**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 Levels 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**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p>processes during international encounters Conflicts and cultural difference Understanding and dealing with conflicts Developing Intercultural relationships.</p> <p><b>EMPLOYABILITY</b></p>							
<p><b>References</b></p> <p>Marie-joelle Browaeyns and Roger Price: Understanding Cross-Cultural Management, Pearson, 2010.  David C. Thomas: Cross Cultural Management, 2/e, Sage Publications, 2008.</p> <p>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. <b>Text Books</b></p> <ol style="list-style-type: none"> <li>1. Helen Deresky, <i>International Management: Managing across Borders and Cultures</i>, 5th Edition, Pearson Education, 2009</li> <li>2. Richard M. Hodgetts &amp; Fred Luthans, (2005), <i>International Management</i>, 3rd Edition, Tata McGraw Hill Publications, New Delhi,</li> </ol> <p><b>Reference Books:</b></p> <ol style="list-style-type: none"> <li>1. Hodgetts, R., M., &amp; Luthans F, (2005), <i>International Management</i>, Tata McGraw Hill Publications, New Delhi.</li> </ol> <p>Hill, C. (2007) <i>International Business: Competing in the Global Marketplace</i>. (6th ed) Tata McGraw-Hill.</p>							



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260EE170		2	0	0	2

**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

**EMPLOYABILITY**

**UNIT V** Forecasting and planning in supply chain management – Pricing in supply

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p>chainmanagement-RoleofITinsupplychainmanagement-co-ordinationinsupplychainmanagement.</p>							
<p><b>TextBooks</b></p> <p>1.ChopraSandPMeindl“Supplychainmanagement:Strategy,planningandoperations”</p> <p>DavidP,“International Logistics”Biztantra,NewDelhi,2006.</p> <p><b>ReferenceBooks:</b></p> <p>1. DonaldJ BowersoxDaviJ Class”LogisticsManagement,TataMc.GrawHill,NewDelhi.</p> <p>2. DavidStewart,”InternationalSupplychainManagement”,Cengagepublications,2008.</p> <p>3. RejiIsmail,“LogisticsManagement”ExcelBooks,2008.</p>							

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260EF100		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 Insured 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..

### Skill development

#### 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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EF38		3	0	0	3
<b>SUBJECT TITLE: INTERNATIONAL STRATEGIC MANAGEMENT</b>							
<p><b>Objectives:</b> 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.</p> <p><b>COURSE OUTCOME</b></p> <p>Understand the basic concepts and principles of strategic management analyse the internal and external environment of business</p> <ul style="list-style-type: none"> <li><input type="checkbox"/> Develop and prepare organizational strategies that will be effective for the current business environment</li> <li><input type="checkbox"/> Devise strategic approaches to managing a business successfully in a global context</li> </ul>							
<p><b>UNIT I</b> 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</p>							
<p><b>UNIT II</b> Nature, components and significance of environmental scanning – Corporate capability analysis – Diagnosing industry globalization potential – Building global market participation – Competition in global industries</p>							
<p><b>UNIT III</b> 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</p>							
<p><b>UNIT IV</b> 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</p>							
<p><b>UNIT V</b> Choice of corporate strategy: CIT, CASCADE and PORTFOLIO MODELS – Formulating generic competitive strategy – Implementing corporate strategy – Strategic control and operational control</p>							

## SKILL DEVELOPMENT

### **TextBooks**

1. John A. Pearce & Richard B. Robinson. Strategic Management AITBS Publication.

### **ReferenceBooks:**

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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EF39		3	0	0	3

**SUBJECT TITLE: GLOBAL BUSINESS ETHICS & CORPORATE GOVERNANCE**

**Objectives:** The course is to sensitize the student 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

**SKILL DEVELOPMENT**

**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

**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. O C Ferrell, John Paul Frederick, Linda Ferrell; *Business Ethics – Ethical Decision Making & Cases*, - Biztantra, New Delhi.



SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EF42		3	0	0	3

**SUBJECT TITLE: MANAGEMENT OF INTERNATIONAL DEVELOPMENT ORGANIZATIONS**

**Objectives:** The course is to sensitize the student 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**

**SKILL DEVELOPMENT**

**Unit-4:** Cooperation and Collaborations: Role of Nations Policies-  
Role of International Government organizations, NGOs, INGOs, MNCs

**Unit-5:** Functional Strategies: In specific issues pertaining to HR, Marketing Management  
and Finance-Case studies.

**References:**

IDO 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.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EF43			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:MERGERSANDACQUISITIONS**

**Objectives:**Thecourseistosensitizethestudentstoissuespertainingtosustainabledevelopment and business ethics and enable development and business ethics and enable themtounderstandtheimplicationsofvariousstatutoryandpolicyguidelinesconcerningcorporate governancefor actualbusinessdecisionmaking.

**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 AcquisitionsCommon Motivations and Impact of Mergers and Acquisitions Challenges towards successfulMergersandAcquisitions.TakeoverTactics:AlternativeTakeoverTacticsAlternativeTakeoverdecision Prebidand Postbid.

**Unit II: Regulatory Issues in Mergers:** Federal Security Laws Insider Trading Laws Antitrustlaws State Regulations effecting Mergers and Acquisitions Regulated industries EnvironmentalLaws LabourandBenefitLaw.

**Unit III: Developing Business and Acquisition Plans:** Planning Based Approach for Mergersand Acquisitions Building Business Plan Building Mergers and Acquisitions plan The SearchandScreeningProcess NegotiationsImplementingPost ClosingEvaluation .

**SKILL DEVELOPMENT**

**UnitIV:Integration:Mergers,AcquisitionsandBusinessAlliances:**TheRoleofIntegration in successful mergers and Acquisitions Integration as a process Integrating BusinessAlliances.

**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 Spin offs and Split ups - **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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EF44			3	0	0	3
<b>SUBJECTTITLE:INTERNATIONALFINANCIALMANAGEMENT</b>							
<b>OBJECTIVE:</b> To give the students an overall view of the international financial system –instrumentsand markets.							
<b>COURSE OUTCOME</b>							
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.							
<b>UnitI</b>							
International Financial Management: An overview, Importance, nature and scope, InternationalBusinessMethods,RecentchangesandchallengesinIFM- HistoryofGlobalMonetarySystems-EvolutionandpracticesinForeignExchangeMarkets- InternationalFinancialInstitutions							
<b>UnitII</b>							
FundamentalsofForeignExchange–Paritytheoryandconditions– FactorsaffectingdeterminationofExchangerate–Various exchangerate types.							
<b>UnitIII</b>							
Exposure and Risk Management - hedging – speculation – arbitrage - internal and externaltechniquesofhedging–derivatives– meaning– significance – types.							
<b>UnitIV</b>							
Regulatory Framework for International Finance - Short term financial management in a globalset-up–treasuryfunctions –InternationalTaxation –DoubleTaxationAvoidanceAgreement							
<b>UnitV</b>							
GlobalcapitalMarkets:Issues,investors,intermediaries.Disintermediation,Deregulation,Securitization,Globalization.VariousofraisingresourcesbyborrowersinInternational markets. Types of Bonds, Floating Rate Notes (FRNs), Deep							

DiscountBonds,ZeroCouponBonds,DualCurrencyBonds,EquityrelatedBonds.Procedurefor  
BondsIssues.

**EMPLOYABILITY**

**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.

# SYSTEMS



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG33		3	0	0	3

**SUBJECTTITLE:SOFTWAREENGINEERING**

**OBJECTIVE:**

This course aims to understand the software engineering and apply the knowledge of a disciplined approach to the development of software and to the management of the software product lifecycle.

**COURSE OUTCOME**

- 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 OF SOFTWARE ENGINEERING**

Software engineering as a discipline, Software processes, Software projects, Requirements engineering processes, System models, Software prototyping, and Formal specification.

**Unit-II SOFTWARE DEVELOPMENT MODELS**

Software Life Cycle, Waterfall model, Spiral model, Incremental Development, Evolutionary Development, Re-use oriented Development.

**Unit-III SOFTWARE DESIGN**

Architectural design, Distributed Systems architecture, OO design, Real-time software design, Design with reuse, User Interface design. Software Metrics: software process and project metrics, technical metrics for software.

**EMPLOYABILITY**

**Unit-IV SOFTWARE QUALITY**

Verification and Validation, Software testing, Critical systems validation, CMM and PCMM concepts.

## **Unit–V        SOFTWAREMANAGEMENT**

Managing people, Software cost construction, Quality Management, Process empowerment. Legacy Systems, Software change, Software re-engineering, Configuration Management.

### **SUGGESTED READINGS:**

1. Roger S. Pressman: Software Engineering – A Practitioner’s Approach – Tata McGraw Hill – IV edition.
2. Sommerville, Ian: Software Engineering, Addison Wesley.
3. S.A. Kelkar, Software Project Management, PHI
4. Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli – Fundamentals of Software Engineering – PHI.

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>		19260EG34		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 student on how to evaluate and assess the projects and to find the cost of the project using cost benefit evaluation techniques.

**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 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.

**EMPLOYABILITY**

**Unit IV SOFTWARE PROJECT MANAGEMENT**

Software project management: challenges & opportunities – changing technologies & approaches – choice development of methodologies & technical platforms, project management techniques – monitoring & measurement of progress.

### **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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG35		3	0	0	3

**SUBJECT TITLE: RELATIONAL DATABASE MANAGEMENT SYSTEMS**

**OBJECTIVE:**

This course helps the students 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**

Understand the basic concepts and the applications of database systems. Master the basics of SQL and construct queries using SQL. Understand the relational database design principles.

**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, 7<sup>th</sup> edition, Pearson Education Asia.
3. Naveen Prakash, Introduction to Database Management, TMH, 1993.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG36		3	0	0	3

**SUBJECT TITLE: E-BUSINESS TECHNOLOGY AND MANAGEMENT**

**OBJECTIVE:**

This course will help the student to recognize and understand ways of fusing 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** 1. understand the issues around defining ‘technology’, ‘innovation’ and ‘innovation management’ 2. recognise the diversity of types of innovation, innovators and innovation settings 3. understand the nature and extent of technological change and innovation 4. 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

**UNIT-IV**

Handling payments: Electronic Fund Transfer System, Digital Token and notational based electronic payments system, smart card, credit card and emerging financial instruments. E-payments - Characteristics of payment of systems, protocols, E-cash, E-check

and Micropayments systems. E-Commerce and Banking: changing dynamics in banking industry; Management Issues in online banking.

## **EMPLOYABILITY**

### **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 – Framework technologies and Applications, 3<sup>rd</sup> Edition. Tata McGraw Hill Publications, 2008.
4. Krishnamurthy - E-Commerce Management: Text and Cases (Vikas)

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG37		3	0	0	3

**SUBJECTTITLE: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- Applications of data warehouse – Benefits 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.

**EMPLOYABILITY**

## **UNIT-V**

WebData Mining- AssociationRule Mining

### **SUGGESTED READINGS:**

1. G.K. Gupta, Introduction to Data Mining with Case Studies, Eastern 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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EG38			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 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;

**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.

**EMPLOYABILITY**

**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.

**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:**

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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG39		3	0	0	3
<b>SUBJECTTITLE:ENTERPRISERESOURCEPLANNING</b>							
<p><b>OBJECTIVE:</b></p> <p>To understand about ERP systems, ERP software and modules, Implementation of ERP, and Emerging trends on ERP.</p> <p><b>OUTCOMES</b></p> <ol style="list-style-type: none"> <li>1. Make basic use of Enterprise software, and its role in integrating business functions</li> <li>2. Analyze the strategic options for ERP identification and adoption.</li> <li>3. Design the ERP implementation strategies.</li> <li>4. Create reengineered business processes for successful ERP implementation</li> </ol>							
<p><b>UNIT–I:Introduction</b></p> <p>Overview of Enterprise Systems – Evolution – Risks and Benefits – Fundamental Technology – Issues to be consider in Planning Design and Implementation of Cross Functional Integrated ERP Systems.</p>							
<p><b>UNIT–II:ERP Solutions and Functional Modules</b></p> <p>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.</p>							
<p><b>UNIT–III:ERP Implementation</b></p> <p>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.</p>							
<p><b>UNIT–IV:Post Implementation</b></p> <p>Maintenance of ERP – Organizational and Industrial Impact; Success and Failure factors of and ERP Implementation. Measuring ERP Benefits – Balanced Score Card Method – ABCD Checklist.</p>							

## **UNIT–V:EmergingTrends onERP**

Extended ERP Systems – CRM, SCM, Business Analytics – Future Trends in ERP Systems – WebEnabled, Wireless Technologies.

### **EMPLOYABILITY**

#### **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



Hallof India,2006.

5. MarySumner,EnterpriseResourcePlanning, 4<sup>th</sup> edition, PearsonEducation.

6. K.Balasubramaniyan, S.Ushapriya &K.Hema, Enterprise Resource Planning :Emergingconcepts &cases

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG42		3	0	0	3
<b>SUBJECTTITLE:INFORMATIONSTORAGEANDMANAGEMENT</b>							
<b>OBJECTIVE:</b> Thiscoursehelpstolearnandunderstandthestoragemangement,virtualizationtechnologies,infrastr uctureand storagesecurity. <b>OUTCOMES</b> 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.							

## **Unit I**

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 data center infrastructure, role of each element in supporting business activities Intelligent Storage system – Introduction to Flash Drives.

## **Unit II**

Hardware and software components of the host environment, Physical and logical components of a connectivity environment, Major physical components of a disk drive and their function, logical constructs of a physical disk, access characteristics - Concept of RAID and its components - Storage Area Networks – Attached Storage: Benefits, components – NAS Protocol & Implementation – File level Virtualization – Object based and Unified Storage: Devices and components.

## **Unit III**

List reasons for planned/unplanned outages and the impact of downtime, Impact of downtime. Differentiate between business continuity (BC) and disaster recovery (DR) - Backup and Recovery – Local Replication: Technologies – Backup in NAS Environments – Data duplication – Remote replication.

## **Unit V**

Information security, Critical security attributes for information systems, Storage security domains, List and analyzes the common threats in each domain, Virtualization technologies – Security implementations in Storage Networking.

## **Unit V**

Managing Storage infrastructure - Storage infrastructure Management Activities & Challenges – Ideal solutions for Storage Infrastructure management – Storage tiering.

## **EMPLOYABILITY**

### **SUGGESTED READINGS:**

1. G. Somasundaram, Alok Shrivastava, "Information Storage and Management", EMCEducation Services, Wiley Publishing, Inc, Edition 2010.
2. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill, Osborne, 2003.

3. MarcFarley,“BuildingStorageNetworks”,TataMcGrawHill,Osborne.2001.
4. MeetaGupta,StorageAreaNetworkFundamentals,PearsonEducationLimited,2002.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG43		3	0	0	3

**SUBJECTTITLE: CLOUD COMPUTING**

**COURSEOBJECTIVE:** To understand basics of cloud computing for business management

**OUTCOMES** 1. 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. 2. Apply the fundamental concepts in datacenters to understand the tradeoffs in power, efficiency and cost. 3. Identify resource management fundamentals, i.e. resource abstraction, sharing and sandboxing and outline their role in managing infrastructure in cloud computing. 4. 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.

**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

**EMPLOYABILITY**

**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, 2<sup>nd</sup> 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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EG44		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.

**UNIT V ADVANCED INTELLIGENT SYSTEMS** Neural Computing, Fuzzy Logic, Intelligent Agents, Implementation, Integration, Intelligent DSS.

**EMPLOYABILITY**

**TEXTBOOK**

1. Efraim Turban and Jay E. Aronson, Decision Support System and Intelligent Systems, Prentice Hall International, 9th Edition 2010

**REFERENCES**

1. Janakiraman V. S. 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

# HOSPITAL MANAGEMENT

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EH33		3	0	0	3

**SUBJECTTITLE:MANAGEMENTOFHOSPITALSERVICES**

**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 clinical and nonclinical 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

**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

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**Unit– IV Hospital Acquired Infection:** Source and Control, Modern trends in Hospital Administration, Disaster Management, Information Systems, Telemedicine.

**EMPLOYABILITY**



**Unit–**

**VDisasterManagementServices:** 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 assess - **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, BM (1998)- Principles of Hospital Administration & Planning-  
Jaypee Publishers New Delhi.
5. Goel, SL (2001 Vol 1-4)-  
Healthcare Systems and Management, Deep and Deep Publications, New Delhi
6. Srinivasan AV (2002)- Managing a modern hospital, Response Books, New Delhi
7. Sharma KR, 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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EH34			3	0	0	3

**SUBJECT TITLE: OPERATIONS MANAGEMENT IN HEALTHCARE**

**OBJECTIVE:**

Gives understanding about various operations related to hospital administrations such as purchase procedures of healthcare equipments and materials, store maintenance, quality management and conduction of healthcare events

**OUT COMES**

- 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- Purchasing System- Purchase Cycle- Purchase methods and Procedures; Planning and Selection of Equipment- Purchase, Inspection and Installation; Import of Equipment**

**Unit II HOSPITAL STORES MANAGEMENT: Planning Consideration of Stores- Inspection and Verification of Materials- Storage of Materials- Codification and Standardization- Value Analysis- Inventory Control- Economic Order Quantity (EOQ), Distribution of Materials- Condemnation and Disposal; Hospital Wastes Management**

**Unit III HOSPITAL MATERIALS AND MAINTENANCE MANAGEMENT: Functions of Materials Manager- Information Systems for Materials Management; Policy and Procedures- Equipments Types and Characteristics; Records, Responsibilities- Level of Maintenance; Equipment Utilization and Operation- Equipment Repair and Maintenance- Equipment Audit**

**EMPLOYABILITY**

**Unit IV QUALITY ASSURANCE IN HOSPITALS:** Patient safety and satisfaction, Patient feedback system, Job Description of Quality Manager- Quality Steering Committee- Quality Council, Quality Audit; Quality Teams: Task Force, Quality Circle- ISO Certification; BSMARK, Accreditation: JCI, Quality Awards Scheme - MBNQA; NABH, Six sigma in hospitals; Obstacles to Practice Quality in Hospitals

#### **Unit V**

**HEALTH PROGRAM / EVENT MANAGEMENT:** Healthcare programs, campaigns and camps; Program need analysis, Planning/Preproject phase (CPM & PERT Analysis), Execution phase – Manpower and quality service delivery requirements, Post project impact analysis

#### **SUGGESTED READINGS:**

1. Donna Deepro, Project Management, Capstone Publishing, Oxford, 2007
2. H. Kerzner, Project Management: A System Approach to Planning, Scheduling and Controlling, Wiley Eastern publication, 2008
3. Shakti Gupta and Sunil Kant, Hospital Stores Management: An Integrated Approach Jaypee Publications, New Delhi, India, 2010
4. WHO, Maintenance and Repair of Laboratory, Diagnostic, Imaging and Hospital Equipment, 2006
5. Wilson CRM, Hospital Wide Quality Assurance, Saunders publication, 2005

6. Hugh C.H. Kogh, Total Quality Management in Health Care, Longman Publication, 2008
7. Roger Ellis and Dorothy Whittington, Quality Assurance in Health Care – A Handbook, Edward Arnold publication, 1998

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EH35		3	0	0	3

**SUBJECT TITLE: MARKETING MANAGEMENT OF HOSPITAL AND HEALTH CARE SERVICES**

**OBJECTIVE:**

Gives better understanding about the way to market health care services. Gives view about the marketing mix for health care services

**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 HEALTH CARE** Concept of Marketing - Importance of Marketing to Healthcare Organizations - Challenges in Practicing Marketing in Healthcare Industry - Marketing Intelligence, Information and Research System - Marketing Organization: Chart, Fulltime Staff and Hiring Consultants

**Unit II MARKETING MIX DECISIONS** Product (Service) Decisions - Nature and Characteristics of Services - Marketing Approaches to New Services Development - Pricing Decisions - Place Decisions - Promotion Decisions - Advertising in Healthcare Industry - Marketing Strategies - Service Portfolio Strategy - Market Expansion Strategy - Target Market Strategy - Price Quality Strategy - Competitive Positioning Strategy.

**Unit III SOCIAL MARKETING** Steps in Social Marketing - Cognitive, Action, Behavior and Value Changes, Media in social Marketing, Social media sources; Social Events and Printed sources; Online sources; Role of social marketing in healthcare

**Unit IV PUBLIC RELATIONS** Introduction to Public Relations, Classification of Public from Healthcare Marketing Perspective, Identifying the Relevant Publics - Measuring Images and Attitude of the Relevant Public - Establishing Image Goals for the Key Publics - Developing Cost Effective Public Relations Strategies - Implementing Actions and Evaluating Results; Health Service Public Relations Officer - Changing Role and Responsibilities of Health Service PRO.

## **EMPLOYABILITY**

### **Unit V COMMUNITY OPINIONS SURVEYS AND MARKET RESEARCH** Market

research–

Model Questionnaire used in Healthcare Services; Public Relations Tools and Materials: Written and Audiovisual; Media: News, Events, Speeches and Telephone Information Services; Data analysis;

Research report preparation and presentation; Decision making based on market research.

**SUGGESTED READINGS:**

1. Philip Kotler and Roberta N. Clarke, *Marketing for Healthcare Organizations*, Prentice Hall Publication, 2009
2. Roger Silver, *Health Service Public Relations*, Radcliffe Medical Press Ltd., 2010
3. John F. O'Malley, *Healthcare Marketing Sales and Services: An Executive Companion*, Health Administration Press, 2011
4. G.D. Kunder, *How to Market Your Hospital Without Selling Your Philosophy*, Prism Books Pvt. Ltd., 2000

5. Philip Kotler, Joel Shalowitz, MD, MBA, Robert J. Stevens, *Strategic Marketing For Health Care Organizations: Building A Customer-Driven Health System*, John Wiley and Sons Inc., Jossey-Bass Publication, 2008



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EH36		3	0	0	3

**SUBJECTTITLE:COMMUNITYHEALTHANDMANAGEMENTOFNATIONALHEALTHPROGRAMMES**

**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 healthcaredeliveryfor community.

**OUTCOMES**

□ To appreciate the Educational heritage of India. □ To understand the nature of Education as a discipline and it's correlation with other disciplines. □ To comprehend the basic features of Indian Constitution and it's 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 andcommunity health; Definition of health:the determinants and relative concept; Agent – Host

–Environmental factors in health and disease, indices used in measurement of health, levels ofprevention; Epidemiology of common communicable diseases and chronic non-communicablediseasesandcondition.

**UNIT – II Health care delivery system in India:** Introduction, Demography and FamilyPlanning;Maternalandchildhealth;Urbanhealth;Occupationalhealth;Mentalhealth;Communitgeriatrics; Essential Medicines andCounterfeit Medicines.

**UNIT – III Health Education:** Definition, approach in health education, methods, barrier toeffective communication, principles of health education; International Health Regulations andInternationalclassification of diseases,

**UNIT–IVInternationalHealthagenciesandorganizations:** WHO,UNICEF,UNOP,WorldBank, UNFPA, CARE,IHO, Notifiable diseases.

**UNIT – V National Health Programs:** Objectives, strategy, achievements, critical analysis;Cancer screening and national cancer control program, National AIDS Controlprogram andNACO,Nationalleprosyeradicationprogram,Universalimmunizationprogram,Nationalvectorb

ornediseasecontrolprogram,RNTCP,RCH,NationalProgramforcontrolofblindness,NationalHealthPolicies,NationalPopulationPolicy, NationalRuralHealthMission.

## **EMPLOYABILITY**

### **SUGGESTED READINGS:**

1. K.Park:Park'sTextbookofPreventiveandsocialMedicine,M/sBanarsidasBhanotPublishers
2. AnnLindstrand,Hans Rosling:An IntroductoryTextbook,GlobalHealth
3. A.B. Christie: Infectious Diseases-Epidemiology and Clinical Practice, ChurchillLivingstone.
4. RameshwariPandya:Health,FamilyPlanningandNutritioninIndia,NewCenturyPublications.
5. S.L.Goel:HealthCarePoliciesandProgrammes,DeepandDeepPublications.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE	10260PH142			2	0	0	2

**SUBJECT TITLE: MANAGEMENT OF CLINICAL AND SUPER SPECIALTY SERVICES IN HOSPITALS**

**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 procedure and policies and procedures followed in each of these.

**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 Hospital Management Of Clinical Services (Medical + Ancillary):** Detailed Management, Layout, Design of - OPD Services, Emergency Services, Clinical Laboratories, Radiological Services, Operation Theatres.

**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.

**UNIT – III Clinical services-3: Operation theatre – Intensive care units – Hospital acquired infections – Sterilization – Nursing services – Ward management.**

**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, New born Nursery.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH142		2	0	0	2
<p><b>UNIT – V Emerging areas in Hospital Services:</b> Alternative and Complimentary medicine, Palliative medicine, promotive Healthcare, home health care; Rehabilitation and De-addiction – Role of hospitals, duties and responsibilities of clinical and paraclinical staff.</p> <p><b>EMPLOYABILITY</b></p>							
<p><b>SUGGESTED READINGS:</b></p> <ol style="list-style-type: none"> <li>1. B.M.Sakhankar: Principles of Hospital Administration &amp; Planning, Jaypee Publications.</li> <li>2. G.D.Kunders: Hospitals-Facilities Planning and Management, Tata McGraw Hill.</li> <li>3. Jaydeep Das Gupta: Hospital Administration and Management – A Comprehensive Guide, Jaypee Publications.</li> <li>4. Shakti Kumar Gupta, Sunil Kant, R Chandreshakhar: Modern Trends in Planning and Designing of Hospitals-Principles &amp; Practice, Jaypee Publications.</li> <li>5. A.V.Ramasastri Srinivasan: Managing a Modern Hospital, Response Books.</li> <li>6. Shakti Gupta, Sunil Kant: Hospital and Healthcare Administration, Jaypee Publications.</li> <li>7. J.Christopher Farmer: Hospital Emergency Management Guidebook, JCI Resource.</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH1144		2	0	0	2

**SUBJECT TITLE: PATIENT CARE MANAGEMENT**

**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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p>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.</p> <p><b>SKILL DEVELOPMENT</b></p> <p><b>Unit V Patient Medical Records:</b> Policies &amp; procedures for maintaining medical records. e-records, legal aspects of medical records, its safety, preservation and storage.</p>							
<p><b>SUGGESTED READINGS:</b></p> <ol style="list-style-type: none"> <li>1. Goel SL &amp; Kumar R. 2004. Hospital Core Services: Hospital Administration of the 21<sup>st</sup> Century. Deep Deep Publications Pvt Ltd: New Delhi</li> <li>2. Gupta S &amp; Kant S. 1998. Hospital &amp; Health Care Administration: Appraisal and Referral Treatise. Jaypee: New Delhi</li> <li>3. Harris MG &amp; Assoc. 2003. <i>Managing Health Service: Concepts &amp; Practices</i>. MacLennan + Petty : Sydney</li> <li>4. Kelly DL. 2006. Encyclopaedia of Quality Management in Hospitals &amp; Health Care Administration. Vol 1-6. Pentagon Press: Chicago</li> <li>5. Kilpatrick AO &amp; Johnson JA. 1999. Handbook of Health Administration &amp; Policy. Marcel Dekker Inc: New York</li> <li>6. Kumar A. 2000. Encyclopaedia of Hospital Administration &amp; Development: Volume I. Anmol</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH146		2	0	0	2
Publications Ltd:New Delhi.							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EH39		3	0	0	3

**SUBJECT TITLE: HEALTH RELATED LAWS AND ETHICS**

**OBJECTIVE:**

To Understand Laws relating to Health services, Legal reports, License, Risk Management.

**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;
3. 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-A Sample Constitution for the Hospital-The Tamil Nadu Clinics Act.

**UNIT – II:**

Laws relating Purchases and funding: Law of contracts-Law of Insurance-Export Import Policy-FEMA-Exemption of Income Tax for Donations-Tax Obligations:Filing Returns and Deductions at Source.

**UNIT – III:**

Laws pertaining to Health: Central Births and Deaths Registration Act, 1969-Recent amendments – Medical Termination of Pregnancy Act, 1971 – Infant Milk Substitutes, Feeding Bottles and Infant Food Act, 1992.

**UNIT – IV:**

Laws pertaining to Hospitals: Transplantation of Human Organs Act, 1994–Pre-natal Diagnostic Techniques (Regulation and Prevention of Misuse) Act, 1994–Medical Negligence



- Medico Legal Case - Dying Declaration-MCI act on medical education. The Biomedical Waste (Management and Handling) Rules-Radiation Safety System.

### SKILL DEVELOPMENT

#### UNIT-V:

Laws pertaining to Manufacture and sale of Drugs: Drugs and Cosmetics Acts, 1940-

Pharmacy Act, 1948 - Drugs and Magic Remedies (Objectionable Advertisement) Act, 1954 -

Poison Act, 1919 - Legislation for Tobacco control.

#### SUGGESTED READINGS:

1. The Law of Health Care Administrations - Stuart Showalter
2. Dynamics of Industrial Relations - C.B. Memoria
3. Industrial laws - N.D. Kapoor

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260FH140		2	0	0	2

**SUBJECT TITLE: MEDICAL TOURISM**

**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.  
**SKILL DEVELOPMENT**

**Unit-V**

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH150		2	0	0	0
<p>Quality Standards in Medical Tourism- Medical Tourism- The Future of Health Services – International Healthcare Accreditation.</p>							
<p><b>SUGGESTED READINGS:</b></p> <ol style="list-style-type: none"> <li>1. Milica Z., Bookman Karla R. Bookman, Medical Tourism in Developing Countries, Palgrave Macmillan 2007.</li> <li>2. Raj Pruthi, Medical Tourism in India, Arise Publishers &amp; Distributors, 2006.</li> <li>3. RNCOS, Opportunities in Medical Tourism in India (2007), RNCOSE- Services Pvt. Ltd., 2006.</li> <li>4. Michael D. Horowitz Jeffrey A. Rosensweig, Medical Tourism – Health Care in The Global Economy (Trends), American College of Physician Executive, 2007.</li> </ol>							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH151		2	0	0	2

**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.

**SKILL DEVELOPMENT**

**UNIT – V:** Facilities planning: Transport – Communication – Food services – Mortuary – Information system – Minor facilities – others.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		18260PH150		2	0	0	2
<b>REFERENCE BOOKS</b>							
<ol style="list-style-type: none"> <li>1. Designing for total Quality in Health Care-G.D.Kunders</li> <li>2. Modern Trends in Planning and Designing of hospitals – Gupta S.K. Sunil Kant Chandra Shekhar. R Satpathy</li> <li>3. Hospital and Nursing Homes Planning, Organisations &amp; Management - Syed Amin Tabish</li> <li>4. Hospitals, Facilities Planning and Management-G.D.Kunders</li> </ol>							

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH152		2	0	0	2

**SUBJECT TITLE: HOSPITAL WASTE MANAGEMENT**

**Objective:** The Objective of the Course is to familiarize the learner with the importance, techniques and the procedures involved in the management of Hospital Waste.

**COURSE OUTCOME**

Learn basic concepts of solid waste management, beginning from source generation to waste disposal in

a system of municipality organizational structure.

- 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.

**UNIT-1:** Hospital Hazards: Meaning – Types – Physical – Biological – Mechanical – Psychological – Its Impact on Employees – Preventive measures.

**UNIT-2:** Hospital Hazards Management: Meaning – Need – Principles – Purpose.

**UNIT-3:** Control of Hospital Acquired Infection: Types of Infection – Common Nosocomial Infection and their Causative Agents – Prevention of Hospital Acquired Infection – Role of Central Sterile Supply Department – Infection Control Committee – Monitoring and Control or Cross-Infection – Staff Health.

**UNIT-4:** Biomedical Waste Management: Meaning – Categories of Biomedical wastes – Disposal of biomedical waste products – Incineration and its importance – Standards for Waste Autoclaving, Micro Waving and Deep Burial – Segregation – Packaging – Transportation – Storage.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10260PH154		2	0	0	2
<p><b>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 – Decomposition of Organic Matter – Modern Sewage Treatment – Drawbacks of improper disposal of wastes – Solid and liquid.</b></p> <p><b>EMPLOYABILITY</b></p>							
<p><b>Reference Books:</b></p> <p>1. Sharma – Holistic approach to Hospital Waste Management published by Dept. of Hospital Administration – AIIMS, New Delhi, 2006.</p>							

# TOURISM



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10060E1156		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

**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.

**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.

**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.

**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. of India, ITDC, Department of Tourism, Govt. of Puducherry, FHRAI, IHA, IATA, TAAI, IATO.

**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.

**EMPLOYABILITY**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<b>TEXTBOOKS</b>							
1. Charles R. Goeldner & Brent Ritchie, J.R. (2006), Tourism, Principles, Practices, Philosophies, John Wiley and Sons, New Jersey.							
2. Bhatia A.K. (2001), International Tourism Management, Sterling Publishers, New Delhi.							
<b>REFERENCES</b>							
1. Page J. Stephen & Brunt Paul (2007), Tourism- A Modern Synthesis, Thomson Publishers, London.							
2. Chuck Y. Gee, James C. Makens & Dexter J.L. Choy (1989), The Travel Industry, Van Nostrand Reinhold, New York.							
3. Ray Youell (1998), Tourism-an introduction, Addison Wesley Longman, Essex.							
4. Ghosh Bishwanath (2000), Tourism and Travel Management, Vikas Publishing House, New Delhi.							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		1006001159		3	0	0	3

**SUBJECT TITLE: TOURISM PRODUCTS OF INDIA**

**OBJECTIVE:**

- To study the vast Tourist resources of India;
- manage merging 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

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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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>WINE TOURISM-CAMPING TOURISM-MEDICAL TOURISM-MICETOURISM-PILGRIMAGE TOURISM.</b></p> <p><b>EMPLOYABILITY</b></p>							
<p><b>TEXTBOOKS</b></p> <p>1. S.P.Gupta(2002),CulturalTourisminIndia,IndraprasthaMuseumofArtandArchaeology,New Delhi.</p>							
<p><b>REFERENCES</b></p> <p>1. StephenBall(2007), EncyclopedeaofTourismResourcesin India,B/H.</p> <p>2. ManojDixit(2002),Tourismproducts,NewRoyalBookCo. Lucknow.</p> <p>3. NormanDouglas.Ed.(2001),SpecialInterest Tourism,</p> <p>4. JohnWiley&amp;Sons,Australia. SarinaSingh(2008),LonelyPlanetIndia.</p> <p>5. RobinetJacob(2007), IndianTourismProducts,AbhijeetPublications,Delhi.</p>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10360E1160		3	0	0	0

**SUBJECT TITLE: DESTINATION PLANNING AND DEVELOPMENT**

**OBJECTIVE:**

- To facilitate the assessment of the tourism potential of a destination and prepare a tourism development plan 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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		1826051161					
<p><b>Unit-V</b> Institutional Support: Public Private Partnership (PPP) - National Planning Policies for Destination Development- WTO Guidelines for Planners - Role of urban civic bodies: Townplanning -Characteristics of rural tourism planning- Environmental Management Systems</p> <p>-Destination Vision- The focus of Tourism Policy: the competitive sustainable destination - Destination Mapping(practical assignment).</p> <p><b>EMPLOYABILITY</b></p>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EI138		3	0	0	3

**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 Publishing.
4. Shalini Singh, Dallen J. Timothy & Ross Kingston Dowling (2003), *Tourism in Destination Communities*, CAB International Publishing.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EI36		3	0	0	3
<b>SUBJECTTITLE:TRAVELAGENCYANDTOUROPERATIONS</b>							
<b>OBJECTIVE:</b>							
<ul style="list-style-type: none"> <li>● Tounderstand thesignificanceof travelagencyand touroperation business;</li> <li>● Toknowthecurrenttrends andpracticesinthetourismandtraveltradesector;</li> <li>● Todevelopadequateknowledgeandskillsapplicabletotravelindustry.</li> </ul> <p><b>COURSE OUTCOME</b> <input type="checkbox"/> defines travel and tourism concepts. <input type="checkbox"/> defines differences between travel and torism concepts.<input type="checkbox"/> explains historical development of travel and tourism concepts.</p> <p><input type="checkbox"/> lists factors which are effective in the definition of travel.</p>							
<b>UNIT-I</b> Travel 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 Scenario ofTravelTrade.							
<b>UNIT-II</b> Travel Agency and Tour Operation Business - Functions of Travel Agency - Settingup a full-fledged Travel Agency - Sources of Income of a travel agency - Diversification ofBusiness - Travel Insurance, Forex, Cargo & MICE - Documentation - IATA Accreditation - Recognitionfrom Government.							
<b>UNIT-III</b> 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).							
<b>UNIT-IV</b> 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-Tourpackages of Thomas Cook,SOTC, Cox&Kingsand TCI.							
<b>EMPLOYABILITY</b>							



**UNIT-V** Role and Responsibility of Travel Trade Associations: Objectives-  
Roles and functions of UFTAA, PATA, ASTA, TAAI, 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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EI37		3	0	0	3

**SUBJECTTITLE: 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-II** 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.

**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.

**EMPLOYABILITY**

**UNIT-V**Yield Management: Elements of yield management, Measuring yield in the Hotelindustry,benefitsofyieldManagement,Challengesorproblemsinyieldmanagement.

## **TEXTBOOKS**

1. JagmohanNegi(1997),ProfessionalHotelManagement,S.Chand,New Delhi
2. G.Raghubalan&SmriteeRagubalan:HotelHousekeepingoperationsandManagement.

## **REFERENCES**

1. JagmohanNegi,Hotels forTourismDevelopment, S.Chand, NewDelhi.
2. JatashankarRTewari(2009),HotelfrontofficeoperationsandManagement,Oxfordpublication New Delhi.
3. GrayandLigouri(2000),HotelandMotelManagementandOperations, PHI,NewDelhi.
4. SudheerAndrews(2009),HotelFrontOfficeTrainingManual,TataMcGrawHill,Bombay.
5. JohnCousinsDavidFoskett&CaileinGillespie(2002),FoodandBeverageManagement,PearsonEducation, England.
6. Arthur&Gladwell,HotelAssistantManager(Londoncommunicate, Barril,Jenkins)

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EI38		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 India 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.

**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.**

**EMPLOYABILITY**



## **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.

SEMESTER	FOUR	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EI39		3	0	0	3

**SUBJECTTITLE: Tourism Marketing**

**OBJECTIVE:**

- To expose the students to concepts and components of marketing;
- To acquaint them with tourism specific marketing skills; and
- To familiarize them with the contemporary marketing practices.

**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 Tourism Marketing - Marketing Functions - Market Research - Tourism Marketing Mix.

**Unit II** Understanding the Market and the Consumer - Marketing Environment - Consumer Behaviour - Buyer Decision Process - Demand Forecasting - Market Segmentation - Targeting - Market Positioning.

**Unit III** The 4 P's of Marketing : Product Designing - Branding and Packaging - New Product Development - Product Life Cycle: Price: Strategies and Approaches; Place: Channels of Distribution, Promotion: Advertising - Sales Promotion - Publicity - Personal Selling; Other P's: People, Physical Evidence and Process.

**Unit IV** Marketing of Tourism & Related Activities - Trends in Tourism Marketing - Marketing of Destinations, Airlines, Hotels, Resorts, Travel Agencies, Events and other Tourism sub-sectors and products.

**EMPLOYABILITY**

**Unit V** Developing Marketing Skills for Tourism - Self Motivation - Team Building - Personality Development - Creativity & Innovation - Innovative Products in Tourism - International Perspective and Contemporary Trends.

**TEXTBOOKS**

1. Manjula Chaudhary (2010), Tourism Marketing, Oxford University Press, New Delhi.

**REFERENCES**

1. Kotler Philip (2006), Marketing Management, PHI, Delhi.
2. Stanton William J (1999), Fundamentals of Marketing, McGraw Hill, New York.
3. Robinet Jacob (2007), Indian Tourism Products, Abhijeet publications.
4. Neelamegham S (1998), Marketing in India: Cases & Readings, Vikas, New Delhi.
5. Ramasamy VS & Namakumar S (1990), Marketing Management: Planning & Control, Macmillan, New Delhi.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EI42			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 Footprints- 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-Qubec 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, Simlipal 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 – theUNWTO,UNDP,WWF-DepartmentofForestandEnvironment-GovernmentofIndia,ATREE,EQUATIONS.**

**EMPLOYABILITY**

**TEXTBOOKS**

- 1.Fennel,D. A.(1999), Ecotourism -AnIntroduction,RoutledgePublication.

**REFERENCES**

1. Weaver,D.(2001),theEncyclopediaofEcotourism,CABIPublication.
2. Fennel,D.A.(2002),EcotourismPolicyandPlanning,CABIPublishing, USA.
3. SukantaKChaudhury,Cultural,EcologyandSustainableDevelopment,Mittal,NewDelhi.
4. RalfBuckley(2004), Environment Impactsof Ecotourism,CABI,London.
5. RameshChawla(2006),EcologyandTourismDevelopment,SumitInternational,New Delhi.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EI43			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:EventManagement**

**OBJECTIVE:**

To familiarize the students with the essentials of Event Management; To understand the potential of MICE and Event Tourism; and

To enable the students 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, PATATravel Mart.**

**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.

<b>SEMESTER</b>	<b>FOUR</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EI44			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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-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 CRS Participation - 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 - VAmadeus Practical - Hands on Amadeus Software - Searching - Building, Retrieval, Display & Cancel of PNR - Fare display - Itinerary pricing - Issuance of tickets.**

**EMPLOYABILITY**

**TEXTBOOKS**

1. Sheldon P. (2002), Tourism Information Technology, CABI.
2. Inkpen G. (2000), Information technology for Travel and Tourism, Addison Wesley.

**REFERENCES**

1. Buhalis D. (2004), E-tourism: Information Technology for Strategic Tourism Management, Prentice Hall India.
2. Poon A. (1998), Tourism, Technology and Competitive Strategies, CABI.
3. Rayport J.F. & Jaworski B.J. (2002), Introduction to E-commerce, McGraw-Hill.
4. Malvino A.P. (1995), Electronic Principles, McGraw-Hill.

# **AGRIBUSINESS MANAGEMENT**

181

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SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EJ33		3	0	0	3

**SUBJECT TITLE: AGRIBUSINESS ENVIRONMENT AND POLICY**

**OBJECTIVE:**

To expose learner 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 Agri business 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.

**EMPLOYABILITY**

**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.

<b>SEMESTER</b>	<b>THREE</b>	<b>NATURE</b>	<b>ELECTIVE</b>	<b>L</b>	<b>P</b>	<b>T</b>	<b>C</b>
<b>COURSECODE</b>	19260EJ34			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SUBJECTTITLE:AGRICULTURALMARKETINGMANAGEMENT**

**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 life cycle.

**UNIT III** Pricing policies and practice for agribusiness - determinants of price, objectives of pricing policies and pricing methods.

**EMPLOYABILITY**

**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.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EJ35		3	0	0	3

**SUBJECTTITLE:FARMBUSINESSMANAGEMENT**

**OBJECTIVE:**

Toacquaintthestudentwiththebasicprinciplesoffarmmanagementdealingwiththeanalysisoffarm resourceshavingalternatives withintheframework of resourcerestrictions.

**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 managementdecisions;farm management problems.

**UNITII**Principlesoffarmmanagementdecisions–principleofvariableproportion,costprinciple, 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;Farmrecordsandaccounts,typesandproblemsinfarmrecordsandaccounts,networthstateme nt,farm efficiencymeasures.

**EMPLOYABILITY**

**UNITIV**Managementoffarmresources – Land, Labour,Farmmachinery, Farmbuilding,etc.

**UNIT V** Risk and uncertainty in farming -sources of uncertainty in farming, management strategyto counteract uncertainty and decision making process in farm business managementunder risksanduncertainty.

**SuggestedReadings**

HeadyEO&JensenH. 1960. *Farm ManagementEconomics*. PrenticeHall.  
 JohlSS&KapoorTR.1973.*Fundamentalsof FarmBusinessManagement*.  
 KalyaniPubl.KahlonAS &SinghK.1992.*Economicsof FarmManagementin India*.Allied Publ.





SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE	19260EJ36			3	0	0	3

**SUBJECTTITLE:MANAGEMENTOFAGRIBUSINESSCOOPERATIVES**

**OBJECTIVE:**

Toacquaintthestudentwiththebasicprinciplesoffarmmanagementdealingwiththeanalysisoffarm resourceshavingalternatives withintheframework of resourcerestrictions.

**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,cooperativesectorand economicdevelopment.

**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, longrangeplanningfor cooperativeexpansion, policymaking.

**SKILL DEVELOPMENT**

**UNIT IV** Human resource management, placement and role of board of directors in cooperativemanagement.

**UNIT V** Overview ofagribusiness cooperative– credit cooperatives,cooperative marketing,dairycooperative; financingagribusinesscooperative.

**SuggestedReadings**

Akmat JS. 1978. *New Dimensions of Cooperative Management*. Himalaya Publ. House.AnsariAA. 1990. *CooperativeManagement Patterns*. Anmol Publ.

SahAK.1984.*Professional Managementforthe Cooperatives*.VikasPubl.House.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		103CCE1100		3	0	0	3

## SUBJECT TITLE: FOOD RETAIL MANAGEMENT

**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.

### SKILL DEVELOPMENT

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>COURSE CODE</b> 1006051100</p> <p><b>UNIT V</b> 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.</p>							
<p><b>Suggested Readings</b>            Berman &amp; Evans. 2008. <i>Retail Management: A Strategic Approach</i>. 10th Ed. Prentice Hall of India.            Cox. 2006. <i>Retailing: An Introduction</i>. 5th Ed. Pearson Edu.            Levy M &amp; Weitz BW. 2004. <i>Retailing Management</i>. 5th Ed. McGraw Hill</p>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10360E1101		3	0	0	3

**SUBJECT TITLE: MANAGEMENT OF AGRICULTURAL INPUT MARKETING**

**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.

**SKILL DEVELOPMENT**

**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-

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE							
103C05H103							
industries Corporation and marketing of farm machines/implements/Equipments.							
<p><b>Suggested Readings</b></p> <p>Acharya SS &amp; Agarwal NL. 2004. <i>Agricultural Marketing in India</i>. 4th Ed. Oxford &amp; IBH. Broadway AC &amp; Broadway Arif A. 2003. <i>A Text Book of Agri-Business Management</i>. Kalyani. Singh AK &amp; Pandey S. 2005. <i>Rural Marketing</i>. New Age.</p> <p>Singh Sukhpal 2004. <i>Rural Marketing-Focus on Agricultural Inputs</i>. Vikas Publ. House.</p>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10360E1102		3	0	0	3

**SUBJECT TITLE: AGRISUPPLYCHAINMANAGEMENT**

**Objective** The course introduces students to the concepts and processes of agricultural supply chain management, framework for structuring supply chain drivers; network designs, demand forecasting, inventory planning, sourcing decisions and IT enablement of supply chain.

**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 Model of Supply Chain Management; Evolution of SCM; SCM Approach; Traditional Agri. Supply Chain Management Approach; Modern Supply Chain Management Approach; Elements in SCM.

**UNIT II** Demand Management in Supply Chain: Types of Demand, Demand Planning and Forecasting; Operations Management in Supply Chain, Basic Principles of Manufacturing Management.

**UNIT III** Procurement Management in Agri. Supply chain: Purchasing Cycle, Types of Purchases, Contract/Corporate Farming, Classification of Purchases Goods or Services, Traditional Inventory Management, Material Requirements Planning, Just in Time (JIT), Vendor Managed Inventory (VMI).

**UNIT IV** Logistics Management: History and Evolution of Logistics; Elements of Logistics; Management; Distribution Management, Distribution Strategies; Pool Distribution; Transportation Management; Fleet Management; Service Innovation; Warehousing; Packaging for Logistics, Third-Party Logistics (TPL/3PL); GPS Technology.

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>UNIT V</b> Concept of Information Technology: IT Application in SCM; Advanced Planning and Scheduling; SCM in Electronic Business; Role of Knowledge in SCM; Performance Measurement and Controls in Agri. Supply Chain Management- Benchmarking: introduction, concept and forms of Benchmarking.</p> <p style="text-align: center;"><b>SKILL DEVELOPMENT</b></p>							
<p><b>Suggested Readings</b></p> <p>Altekar RV. 2006. <i>Supply Chain Management: Concepts and Cases</i>. Prentice Hall of India.</p> <p>Monczka R, Trent R &amp; Handfield R. 2002. <i>Purchasing and Supply Chain Management</i>. Thomson Asia.</p> <p>van Weele AJ. 2000. <i>Purchasing and Supply Chain Management Analysis, Planning and Practice</i>. Vikas Publ. House.</p>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		103CCE1105		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

**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.

**EMPLOYABILITY**

**UNIT-**

**V: AGRICULTURE AND GLOBALIZATION** International trade in agricultural commodities- Role of World Trade Organization; Issues in liberalization of domestic and



SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE: 19360E1106							
international trade in agriculture - Impact of WTO on Indian agriculture							
<p><b>Suggested Reading:</b></p> <ol style="list-style-type: none"> <li>1. Mishra and Puri: Indian Economy, (Latest Edition) Himalaya Publishing House, New Delhi</li> <li>2. Rudrar Dutt and K.P.M. Sundaram: Indian Economy, (Latest Edition) S. Chand &amp; Co., New Delhi</li> <li>3. Ministry of Finance, Govt. of India: Economic Survey, various issues</li> <li>4. Economic and Political Weekly, Selected Articles</li> <li>6. Ministry of Agriculture, Govt. of India, "Indian Agriculture at a Glance 2012"</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		10360E1107		2	0	0	2

**SUBJECT TITLE: AGRICULTURAL AND MICRO-FINANCE**

**Objective:** Objective: To familiarize students with the Agricultural Financial System, Microfinance System and tools and techniques used for better management decisions.

**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 credit system, Agricultural credit Structure in India. Non-institutional financing for Agriculture, Merits and Demerits. Management of Agri-Finance: View point of Borrower and lender. Economic feasibility Tests of Farm credit proposal (Three R's of credit & Four C's of Credit).

**UNIT-II** Methods and mechanics of Lending to Agriculture, Role and functions of NABARD for Agriculture Finance Role of Commercial Bank and Agricultural Finance, Regional Rural Banks and Rural Finance, Its viability, Problems and challenges

**UNIT-III** Multi-agency Approach to agricultural Finance, Problems of Over dues of Agricultural loans. Measures to overcome the Problem of over dues. Public Farm Financing Schemes: Financing of Bio-Gas Plant, Financing of Poultry Development, Financing of Dairy Development, Financing of Customs Services Units, Financing of Minor Irrigation Schemes

**UNIT-**

**IV** Microfinance: Concept and Revolution, Grameen experiment. Growth and development of Micro-finance in Bangladesh, World without poverty- Views of Muhammad Yunus. Microfinance and SHGs in India and its importance for socio-economic development of poor families.

**EMPLOYABILITY**

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
<p><b>UNIT-V</b> Microfinance and women empowerment. Role of NABARD in linking SHGs with Banks, Growth and Development. SGSY and SHGs. Role of MFIs (Non-Banking Financial Institutions) in expanding micro-credit facilities for the poorest of poor in the country. These MFIs include SKS microfinance, SHARE, BASIX, etc. Some case studies on microfinance and Agriculture Finance.</p>							
<p><b>Suggested Readings:</b></p> <ol style="list-style-type: none"> <li>1. S.S.M. Desai: Agriculture &amp; Rural Banking in India, HPH</li> <li>3. Pension: Agricultural Finance, Tata McGraw Hill</li> <li>4. Bauman, I. Dieselam &amp; EC: Capital and Credit Needs in Changing Agriculture, PHI</li> <li>5. Rais Ahmed: Micro-Finance and Women Empowerment. Mittal Pub. New Delhi</li> <li>6. Malcolm Harper: Practical Micro-Finance - A Training Guide for South Asia</li> <li>7. K.G. Karmakar, Rural and Self Help Groups Microfinance Needs and concepts in India, S Aga Pub.</li> </ol>							

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EJ44		3	0	0	3

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSECODE		19260EJ44		3	0	0	3

**SUBJECT TITLE: NEW TRENDS AND DEVELOPMENT IN AGRICULTURE SECTOR**

**Objective:** 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, Benefit of biodiesel in comparison to crude diesel/petrol, Manufacturing biodiesel, Algal biodiesel.

**EMPLOYABILITY**

**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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
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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

SEMESTER	THREE	NATURE	ELECTIVE	L	P	T	C
COURSE CODE		1026051301		3	0	0	3

#### 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 McGraw 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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**SCHOOL OF ARTS OF SCIENCE**

**DEPARTMENT OF CHEMISTRY**

**B.Sc CHEMISTRY CURRICULUM**

**REGULATION 2019**



**SCHOOL OF ARTS AND SCIENCE**  
**DEPARTMENT OF CHEMISTRY**  
**B.Sc CHEMISTRY – REGULATION 2019**  
**COURSE STRUCTURE**

<b>SEMESTER – I</b>					
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19110AEC11/ 19111AEC11/ 19132AEC11/ 19135AEC11	Tamil – I / Advanced English – I / Hindi – I / French-I	4	0	0	2
19111AEC12	English – I	4	0	0	2
19114AEC13	General Chemistry - I	6	1	0	6
19114AEC14L	Volumetric Analysis Lab	0	0	3	2
19112AEC15A	Calculus and Fourier Series	4	0	0	4
19112AEC16A	Algebra and Trigonometry	4	0	0	4
191_SEC01_	Skill Based Elective - I	0	0	2	1
19111SEC01L	Communicative English Lab – I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>23</b>
<b>SEMESTER - II</b>					
19110AEC21/ 19111AEC21/ 19131AEC21/ 19135AEC21	Tamil – II / Advanced English – II / Hindi – II / French-II	4	0	0	2
19111AEC22	English – II	4	0	0	2
19114AEC23	General Chemistry - II	6	1	0	6
19114AEC24L	Organic Analysis Lab	0	0	3	2
19112AEC25A	ODE,PDE and Laplace Transform	4	0	0	4
19112AEC26A	3D Vector Calculus	4	0	0	4
19114RLC27	Research Led Seminar	–	–	–	1



191_SEC02_	Skill Based Elective - II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	2	1
	<b>Total</b>	<b>22</b>	<b>1</b>	<b>7</b>	<b>23</b>
<b>SEMESTER – III</b>					
19110AEC31/ 19111AEC31/ 19131AEC31/ 19135AEC31	Tamil – III / Advanced English – II I / Hindi – III / French-III	4	0	0	2
19111AEC32	English – III	4	0	0	2
19114AEC33	General Chemistry - III	6	0	0	6
19114AEC34L	Physical Chemistry Lab - I	0	0	3	3
19113AEC35	Physics - I	5	0	0	4
19113AEC36L	Physics Lab - I	0	0	3	2
19114RMC37	Research Methodology	3	0	0	3
191_SEC03_	Skill Based Elective - III	0	0	2	1
19111SEC03L	Communicative English Lab - III	0	0	2	1
	<b>Total</b>	<b>22</b>	<b>0</b>	<b>10</b>	<b>24</b>
<b>SEMESTER - IV</b>					
19110AEC41/ 19111AEC41/ 19131AEC41/ 19135AEC41	Tamil – IV / Advanced English – IV / Hindi – IV / French-IV	4	0	0	2
19111AEC42	English-IV	4	0	0	2
19114AEC43	General Chemistry - IV	6	01	0	6
19114AEC44L	Physical Chemistry Lab - II	0	0	3	3
19113AEC45	Physics - II	5	0	0	5
19113AEC46L	Physics Lab - II	0	0	3	2
191_SEC04_	Skill Based Elective - IV	0	0	2	1
19111SEC04L	Communicative English Lab -IV	0	0	1	1
191ENVTSTU	Environmental Studies	1	0	0	1
	<b>Total</b>	<b>21</b>	<b>01</b>	<b>9</b>	<b>23</b>
<b>SEMESTER - V</b>					

19114AEC51	Inorganic Chemistry - I	5	0	0	5
19114AEC52	Organic Chemistry - I	5	0	0	5
19114AEC53	Physical Chemistry - I	4	1	0	4
19114AEC54L	Inorganic Qualitative Analysis Lab	0	0	3	3
19114AEC55L	Gravimetric Analysis Lab	0	0	3	3
19114DSC56_	Discipline Specific Elective -I	5	0	0	4
19114BRC57	Participation in Bounded Research	-	-	-	2
191_SEC05_	Skill Based Elective - V	0	0	2	1
19111SEC05L	Communicative English Lab – V	0	0	2	1
	<b>Total</b>	<b>19</b>	<b>1</b>	<b>10</b>	<b>8</b>

### SEMESTER - VI

19114AEC61	Inorganic Chemistry - II	5	1	0	5
19114AEC62	Organic Chemistry - II	5	1	0	5
19114AEC63	Physical chemistry - II	5	1	0	5
19114DSC64_	Discipline Specific Elective - II	5	0	0	4
191__OEC65_	Open Elective	4	0	0	2
19114PRW66	Project Work	0	0	0	5
191_SEC06_	Skill Based Elective - VI	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	2	1
19114EXACT_	Extension Activities	0	0	0	1
19114PEE	Programme Exit Examination	0	0	0	2
	<b>Total</b>	<b>23</b>	<b>03</b>	<b>04</b>	<b>31</b>
<b>Total Credits of the Program</b>					<b>15 2</b>

**DISCIPLINE SPECIFIC ELECTIVE COURSES -I**

Semester	Elective No.	Course Code	Course Title
V	I	19114DSC56A 19114DSC56B	a) Pharmaceutical Chemistry b) Agricultural Chemistry

**DISCIPLINE SPECIFIC ELECTIVE COURSES –II**

Semester	Elective No.	Course Code	Course Title
VI	II	19114DSC66A 19114DSC66B	a) Polymer Chemistry b) Nano Science

**OPEN ELECTIVE COURSES**

Semester	Course code	Course Title
VI	19110OEC	Tamil Ilakkiya Varalaru
	19111OEC	Journalism
	19112OEC	Development of Mathematical Skills
	19113OEC	Instrumentation
	19116OEC	Wildlife Conservation
	19120OEC	E-Learning
	19120OEC	Web Technology
	19161OEC	Banking Service

### SKILL BASED ELECTIVE COURSES

Semester	Skill Based Elective	Course Code	Course Title
I	I	19120SEC01AL 19160SEC01B	a) Package Lab - I b) Effective Communication
II	II	19120SEC02AL 19160SEC02B	a) Package Lab - II b) Self Development
III	III	19120SEC03AL 19160SEC03B	a) Package Lab - III b) Interpersonal Relations and Social Responspilities
IV	IV	19120SEC04AL 19160SEC04B	a) Package Lab - IV b) Etiquette and Interviewing Skills
V	V	19120SEC05AL 19160SEC05B	a) Package Lab - V b) Leadership Skills and Body Language
VI	VI	19120SEC06AL 19160SEC06B	a) Package Lab - VI b) Life Skills and other Skills

### RESEARCH BASED COURSES

Semester	Course Code	Course Title
II	19114RLC27	Research Led Seminar
III	19114RMC37	Research Methodology
V	19114BRC57	Participation in Bounded Research

### CREDIT DISTRIBUTION

SEMESTER	AEC	SEC	DSC	OEC	RESEAR CH	OTHE RS	TOTA L
I	19	03				01	<b>23</b>
II	19	03			01		<b>23</b>
III	18	03			03		<b>24</b>
IV	19	03				01	<b>23</b>
V	19	03	04		02		<b>28</b>
VI	14	03	04	02	05	02	<b>31</b>
<b>TOTAL</b>	<b>108</b>	<b>18</b>	<b>8</b>	<b>2</b>	<b>11</b>	<b>03</b>	<b>152</b>

**SEMESTER – I**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19110AEC11	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, ஞயம்பட உரை, இடம்பட வீடு எடேல், இணக்கம் அறிந்து இணங்கு, தந்தை தாய்ப்பேன், நன்றி மறவேல், பருவத்தே பயிர்செய், இயல்பு அலாதன செயேல், வஞ்சகம் பேசேல், இளமையில்

கல்,அனந்தல்ஆடேல்,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
19111AEC11	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
19111AEC12	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
19114AEC13	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
19112AEC15A	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)

$$\int_a^b e^{ax} x^n dx$$

$$\int_a^b \sin^n x dx$$

$$\int_a^b \cos^n x dx$$

$$\int_0^x e^{ax} x^n dx$$

$$\int_0^x \sin^n x dx$$

without proof  $\int_0^{\pi/2} \sin^n x \cos^n x dx$  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  $2\pi$  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
19112AEC16A	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  $\theta$  ( $\theta$  – given in radius) Expansion of  $\sin \theta$ ,  $\cos \theta$  and  $\tan \theta$  in terms of powers of  $\theta$  (only

problems in all the above)

Unit – IV

Euler’s formula for  $ei\theta$  – 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
19114SEC14L	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
19120SEC01AL	Package Lab-I	0	0	2	1

## Package Lab -1 (MS-Word)

Prepare a bio-data with photo using text styles.

Prepare a college course details with headings, bullets and numbering.

Prepare a document in a newspaper format with header and footer.

Create a calendar by using auto format.

Prepare a contemporary letter using templates.

picture insertion and alignment

prepare a greeting card

prepare a handout

Create a mark sheet using tables. And find out the total marks.

Prepare a business letter for more than one company using mail merge

COURSE CODE	COURSE TITLE	L	T	P	C
19111SEC01L	Communicative English Lab-I	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

### References:-

A Practical English Grammar, A.J Thomson and A.V.Martinet

English Grammar, Wren and Martin

### Skill development

COURSE CODE	COURSE TITLE	L	T	P	C
191INDCONS	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 1955.
- 3) Markandan. k.c.directive Principles in the Indian constitution 1966.
- 4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

## SEMESTER – II

COURSE CODE	COURSE TITLE	L	T	P	C
19110AEC21	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, 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)

COURSE  
CODE

COURSE TITLE

1927

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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
19111AEC22	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

1929

-K.A. Abbas

I Have a Dream  
 Those People Next Door  
 UNIT – V  
 Marriage is a private Affair  
 The Fortune Teller  
 Proposal

-Martin Luther king  
 -A.G. Gardiner  
 -Chinua Achebe  
 -Karel Capek  
 -Anton Chekov

References:-

Gathered Wisdom

-GowriSivaraman EmeraldPublishers

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC23	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 HgSO<sub>4</sub> 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 extension. 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, 1989.

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
19114SEC24L	Organic Analysis Lab 1931	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
19112AEC25A	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 slanted 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 ) Charpit'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 only)  $L(e^{-st} \cos bt)$ ,  $L(e^{-st} \sin bt)$ ,  $L[e^{-st} f(t)] = L[F(t)]$ ,  $L[f'(t)]$

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 coefficients. 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
19112AEC26A	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. Manickavasagem Pillai, Analytical Geometry (3D) & Vector calculus, Neq 1934

COURSE CODE	COURSE TITLE	L	T	P	C
19120SEC02AL	Packages Lab-II	0	0	2	1

Package Lab -II (MS –Excel)

- Prepare the addressing methods in excel
- Describe the type of function
- Draw a graph by using your own data
- Prepare an Individual Pay Bill preparation for a employee in an organization.
- Prepare a Mark list preparation for a student.
- Prepare a Worksheet preparation for a company.
- Prepare a Inventory Preparation
- Prepare a Electricity Bill Preparation

COURSE CODE	COURSE TITLE	L	T	P	C
19111SEC02L	Communicative English-II	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 –1

Auxiliaries

UNIT –II

Modals

UNIT –III

Tenses-Simple, Perfect

UNIT –IV



Tenses-Continuous, Perfect continuous

UNIT –V

Articles

Participle

Reference

A Practical English Grammar

-A.J Thomson and A.V.Martinet

English Grammar

-Wren and Martin

Skill development

SEMESTER – III

COURSE CODE	COURSE TITLE	L	T	P	C
19110AEC31	Tamil –III	4	0	0	2

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

**ஓப்படைவு – 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 செம்போன் 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 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
19111AEC31	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
19111AEC32	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
19114SEC33	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  $\pi$  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-

Naphthalene 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 & Mohankatyay, Text Book of Inorganic Chemistry 20th Revised edn., Sultan Chand 1992.

R.B.Puri & L.R.Sharma, "Principles of Inorganic Chemistry," Sultan Chand, 1989.

P.L.Soni & H.M.Chawla "Text book of Organic Chemistry' Sultan Chand & Sons 1994, 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". 1987, 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
19114SEC34L	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)  
 – (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
19113AEC35	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 Berkeley 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 calorimeter.

Conduction: Coefficient of thermal conductivity – good and bad conductor – Stefan's law of radiation - Solar constant – Angstrom's pyro 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 Subramaniam.

Optics, Brijal Subramaniam.

Static, Hydrostatics and Hydrodynamics, Nrayanamoorthy & Nagarathinam.

COURSE CODE	COURSE TITLE	L	T	P	C
19113AEC36L	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
19114RMC37	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, 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.

COURSE CODE	COURSE TITLE	L	T	P	C
19120SEC03A L	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 Skill development

**SEMESTER – IV**

COURSE CODE	COURSE TITLE	L	T	P	C
19110AEC41	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- 34,173,189,235,279

**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.

(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
19111AEC41	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
19111AEC42	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

1950

-.Devaraj Emerald Publishers

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC43	General Chemistry - IV	6	0	0	6

**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**

**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 Cp and Cv;

#### 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
19114SEC44L	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  $\text{KMnO}_4$   
 KI Vs  $\text{KMNO}_4$   
 FAS VS  $\text{K}_2\text{Cr}_2\text{O}_7$   
 KI Vs  $\text{K}_2\text{Cr}_2\text{O}_7$   
 Determination of solubility of silver salts.

COURSE CODE	COURSE TITLE	L	T	P	C
19113AEC45	Physics- II	5	0	0	5

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, Subraction, 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 tables

.

#### 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
19113AEC46L	Physics Lab - II	0	0	3	2

#### List of Experiments

Figure of merits of Galvanometer

Potentiometer – Ammeter calibration

Carey Forster Bridge

Viscosity of Liquid – Poiseuille’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
19120SEC04A L	Packages Lab-IV	0	0	2	1

## Package Lab -IV (MS-Access)

Create a database and a simple table

Create a database for sorting the marks scored by the student in the universality exams

Create a database for sorting the date of joining by the employee in the organization.

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 employee database

COURSE CODE	COURSE TITLE	L	T	P	C
19111SEC04L	Communicative English-IV	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

### References:-

A Practical English Grammar

-A.J Thomson and A.V. Martinet

English Grammar

-Wren and Martin

Technical Communication

-Meenakshi Sharma &

Sangeetha Sharma

COURSE CODE	COURSE TITLE	L	T	P	C
191ENVTSTU	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 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

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC51	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 it's Applications: Symmetry elements —symmetry operations — mathematical group of multiplication tables, point group of simple molecules (H<sub>2</sub>, HCl, CO<sub>2</sub>, H<sub>2</sub>O, BF<sub>3</sub> and NH<sub>3</sub>).

#### 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
19114SEC52	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.

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  $\alpha$ -hydrogen. Mechanisms of aldol, Perkin, Knoevenagel and benzoin condensations. Mechanisms of Claisen, Reformatsky, Wittig and Cannizzaro reactions. Mechanisms of reduction (sodium borohydride,  $\text{LiAlH}_4$ , 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, Bischer 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. (1998)

P.L Soni And H. M Chawala, Text book of Organic Chemistry — 28th edition (1999)- 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, 1975

P.S.Kalsi, Organic Reactions and Their Mechanisms, New Age International Publishers.

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC53	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 thermochemical data, temperature dependence of  $H$  - 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-  $A$  and  $G$  as criteria for thermodynamic equilibrium and spontaneity — variation of  $A$  and  $G$  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 LeChatelier'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- Lennard-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.(1999).

Samuel Glasstone, Thermodynamics for Chemists.

R.L.Madan, G.D.Tuli, Simplified Course in Physical Chemistry, S.Chand & Co., New Delhi(1999).

Rajaram and Kuriacose, Thermodynamics for Students of Chemistry.

P.W.Atkins, Physical Chemistry, ELBS, Oxford Univ. Press, 1998.

COURSE CODE	COURSE TITLE	L	T	P	C
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19114SEC54L	Inorganic Qualitative Analysis Lab	0	0	3	3
<p>Analysis of a mixture containing two cations and two anions of which one will be an interfering ion.</p> <p>Semimicro methods using the conventional scheme with hydrogen sulphide may be adopted.</p> <p>Cations: Pb, Co, Cd, Fe, Al, Zn, Cu, Ni, Sr, Mg and Sb.</p> <p>Anions: Sulphide, bromide, chromate, arsenate, fluoride, oxalate, chloride, carbonate and sulphate.</p>					

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC55L	Gravimetric Analysis Lab	0	0	3	3
<p>Estimation of:</p> <p>Barium as barium chromate</p> <p>Nickel as nickel dimethylglyoxime complex.</p> <p>Lead as lead chromate.</p> <p>Calcium as calcium oxalate.</p> <p>Lead as lead sulphate.</p>					

COURSE CODE	COURSE TITLE	L	T	P	C
19114DSC56A	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.



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, B<sub>1</sub> and B<sub>2</sub>, 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 uses of chloramphenicol and penicillin.

#### 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
19114DSC56B	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- compatibility 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, endosulfon.

#### UNIT - V

FUNGICIDES-inorganic-sulphur compounds-copper compounds- Mercuric compounds-organic- dithio carbamates – dithane M.boredeaux mixture Herbicides: Inorganic herbicides- 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 publishinghouse,(P) Ltd 9th Ed.1984

2. Biswas,T.D.and Mukeherjee S.K.1987 Text book of soil science.

- 3.A.J.Daji(1970) A Text book of soil science-Asia publishing house,Madras.
- 4.Donahue,R.LMiller,R.W.and shuckluna,J.C.1987.soils-An introduction to soils and plant Growth —Prentice Hall of India (p) Ltd, NewDelhi.
5. Colling,G.H.1955,Commercial Fertilizers-McGraw Hill Publishing Co., New york.

COURSE CODE	COURSE TITLE	L	T	P	C
19120SEC05AL	Package Lab - V	0	0	2	1

#### Package Lab -V ( PHOTOSHOP)

Design a Visiting card.

Design a Identity card.

Design a letter pad with LOGO.

Create an advertisement for News paper and Poster creation.

Design a calendar with pictures.

Design a Magazine.

Create a front page for a Magazine

Design a CD Cover.

URSE CODE	COURSE TITLE	L	T	P	C
19111SEC05L	Communicative English - V	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 –1

Correct the spelling mistakes

Comprehension

UNIT –II

Find the odd one out

Picture description

UNIT –III

Abbreviations

Note making

UNIT –IV

Gender

Dialogue writing

UNIT –V

Acronyms

Concord

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

Reference:

P.L. Soni, Mohan Katyal, Text B

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC61	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).

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
19114SEC62	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 amino acids. 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 oxyclope rearrangements, Fries rearrangement (Two mechanisms).

#### UNIT — V

**NATURAL PRODUCTS:** Terpenes, geraniol, nerol, menthol, and  $\alpha$  - terpinol Alkaloids — general and methods of isolation and general methods of structural determination of coniine, piperine and nicotine. Vitamins — thiamine, riboflavin, pyridoxine and ascorbic acid occurrence and biological importance. Structural elucidations of pyridoxine and ascorbic acid.



1. P.L. Soni and H.M. Chawla, Text Book of Organic Chemistry',27th Edn., Sultan Chand 1997.
  2. V.S.Parnar and H.M.Chawla, Principles of Reaction Mechanisms in Organic Chemistry, 27th Edn., Sultan Chand 1998.
- Subash. Chandra Rastogi, Satis Kumar, Agarwala Ashok Kumar 'Sharma , Chemistry of Natural Products, Vol.I & II., 1St Edn.1974-75.
- Ernest L Elliel, Stereochemistry of Cabon Compounds, Tata Mc-Grave Hill Publishing company Ltd., 19th Edn., 1995
- M.K.Jain, Organic Chemistry, Shoban Lal Nagin Chand and Co., 12 th Edn.

COURSE CODE	COURSE TITLE	L	T	P	C
19114SEC63	Physical chemistry - II	5	1	0	4

Aim:

To know about the electrical properties and spectroscopy characteristics of molecules.

Objective:

To understand the shapes of different orbitals.

To understand different principles for filling electrons.

To understand how to draw energy diagrams.

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

**ELECTRICAL CONDUCTANCE:** Electrical transport and ohm's law, conduction in metals and in electrolyte solutions. Specific conductance and equivalent conductance, measurement of equivalent conductance using Kohlrausch's bridge - variation of equivalent conductance with concentration - migration of ions- Kohlrausch's law and its applications. Arrhenius theory of electrolytic dissociation and its limitations. Weak and strong electrolyte Ostwald's dilution law, its uses and limitations. The elementary treatment of the Debye-Huckel-Onsager equation for strong electrolytes. Evidence for ionic atmosphere. The conductance at high fields(Wien effect) and high frequencies(Debye-Falkenhagen effect). Transport number and Hittorf s rule-determination by Hittorf s method and moving boundary method. Application of conductance measurements,determination of  $\alpha$  of a strong electrolyte and acids, determination of  $K_a$  of acids, determination of solubility

product of a sparingly soluble salt, common ion effect and conductometric titrations.

## UNIT -II

**ELECTROKINETIC'S PHENOMENA:** Theories of electrical double layer - electrical double layer potential — theory of multiple layers at electrode and electrolyte interface — double layer capacity — electrokinetic's phenomena (zeta potential, electro osmosis, sedimentation potential).

## UNIT- III

**FAST REACTION TECHNIQUES:** Flow methods (continuous and stopped flow methods), relaxation methods (T and P jump methods), pulse techniques (pulse radiolysis, flash photolysis, shock tube method), molecular beam method — lifetime method.

## UNIT- IV

**EQUILIBRIA IN ELECTROCHEMICAL CELLS:** Electrolytic and galvanic cells, reversible and irreversible cells, conventional representation of electrochemical cells. Electromotive force of a cell and its measurements. Computation of cell, e.m.f. calculation of thermodynamic quantities of cell reactions ( $\Delta G$ ,  $\Delta H$ ,  $\Delta S$  and  $K$ ). Applications of Gibbs - Helmholtz equation. Types of reversible electrodes — gas/metal ion, metal/metal ion, metal insoluble salt/anion and redox electrodes, electrode reactions. Nernst equation — derivation of cell E.M.F. and single electrode potentials. Standard hydrogen electrode — reference electrodes — standard electrode potentials — sign conventions — electrochemical series and its significance. Concentration cell with and without transport, liquid junction potential. Application of concentration cells — valency of ions, solubility product and activity co-efficient, potentiometric titrations. Determination of pH using hydrogen, quinhydrone and glass electrode. Determination of pKa of acids by potentiometric methods. Corrosion — general theory — electrochemical theory — passivity and prevention of corrosion.

## UNIT- V

**MOLECULAR SPECTROSCOPY:** Definition of spectrum, electromagnetic radiation, interaction of electromagnetic radiation with molecules and quantization of different forms of energies in molecules (translational, rotational, vibrational and electronic).

**MICROWAVE SPECTROSCOPY:** Theory of microwave spectroscopy — condition — molecular rotation — selection rules. Effect of isotopic substitution, calculation of moment of inertia and bond length of diatomic molecules.

References:

1. B.R. Puri and L.R. Sharma, Principles of Physical Chemistry.
2. R.P. Varma and Pradeep, Physical chemistry.
3. C.N. Banwell, Fundamental Molecular Spectroscopy; Tata McGraw Hill Publications, New Delhi, 11th reprint 1991.
4. William Kemp, Organic spectroscopy, ELBS, 2nd Edn., 1987.
5. Dr. S. Jain and S.P. Jankar, Physical chemistry - Principles and Problems, Tata McGraw Hill, New Delhi, 1990.
6. B.K. Sen Quantum chemistry.
7. K.V. Raman, Spectroscopy and Mathematics of Quantum Chemistry
8. R. Chang, Basic Principles of Spectroscopy.
9. Dyer "Organic Application of Spectroscopy"
10. Y.R. Sharma, Elementary Organic Spectroscopy-Principles and Applications.
11. G.M. Barrow, Introduction to Molecular Spectroscopy, Tata McGraw Hill, New York, 1964.

COURSE CODE	COURSE TITLE	L	T	P	C
19112DSC64A	Discipline Specific Elective:II Nano Science	4	0	0	4

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:

### 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 (TiO<sub>2</sub>, CeO<sub>2</sub>, ZnO, MgO) - Semiconductors (Si, Ge, CdS, ZnSe). Classifications of nanomaterials-zero dimensional-onedimensional-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
19112DSC66A	Discipline Specific Elective:II Polymer Chemistry	4	0	0	4

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:

Introduction to Polymers by R. J. Young and P. A. Lovell.

Polymer Chemistry: An Introduction” by Malcolm P. Stevens.

Polymer Chemistry” by B.K. Sharma.

Introductory Polymer Chemistry ” by G.S. Misra.

Textbook of polymer Science-FW Billmeyer

Introduction of Polymer Chemistry, R.P. Seymour Mc-Graw Hill, New York,

Polymer Science, V.R. Gowrikar, N. V. Viswanathan, Wiley Eastern Ltd.

Course Code	Course Title	L	T	P	C
19211OEC	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
19212OEC	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

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
19213OEC	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

R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)

Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

### Book for Reference

M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
19214OEC	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 CO<sub>2</sub> - 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
19215OEC	Open elective-Bio-Analytical Techniques 1985	4	0	0	2

Aim:

Bioanalysis is a sub-discipline of analytical chemistry covering the quantitative measurement of xenobiotics (drugs and their metabolites, and biological molecules in unnatural locations or concentrations) and biotics (macromolecules, proteins, DNA, large molecule drugs, metabolites) in biological

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.

Outcomes

The students learn various techniques and acquire the skills to use appropriate methods.

The students acquire the good laboratory practices.

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:

Biophysical Chemistry – Nirmalendu nath

Biophysical Chemistry – Upadhyay, Upadhyay and nath.

Principles and techniques of practical Biochemistry – Keith Wilson and Walker.

Principles of Instrumental analysis – B.K.Sharma.

Instrumental analysis – Chatwall Anand

Course Code	Course Title	L	T	P	C
19220OEC	Open Elective-Internet & Web Design	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: Bus, 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 Learning Publishers.

8. Leon and Leon, “Internet for Everyone”, Vikas Publishing House.

Course Code	Course Title	L	T	P	C
19261OEC	Open Elective-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.

Outcome:

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	Course Title	L	T	P	C
19280OEC	Open Elective-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

Outcome:

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	COURSE TITLE	L	T	P	C
19120SEC06AL	Package Lab-VI	0	0	2	1

Drawing and painting original art in flash.

Creating simple objects using flash.

Creating a frame-by-frame animation techniques.

Develop a program for animation with motion Twenning.

Develop a program for animation with shape Twenning.

Develop a program for adding sound to your movies.

Create a simple Banner.

Create a simple animations techniques movie clip and graphic symbols.

COURSE CODE	COURSE TITLE	L	T	P	C
19111SEC06L	Communicative English Lab - VI	0	0	2	1

Aim:

To develop communicative skills

Objectives:

To extract the main ideas from a text 1991



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

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



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**M.Sc CHEMISTRY CURRICULUM**

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**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

<b>Programme Outcome-PO Programme Educational Outcome - PEO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>PE01</b>	✓					
<b>PE02</b>						
<b>PE03</b>		✓				
<b>PE04</b>			✓			
<b>PE05</b>						
<b>PE06</b>					✓	
<b>PE07</b>				✓		
<b>PE08</b>						✓

### M.Sc Curriculum Mapping

#### Programme Outcome vs Courses Outcome

<b>Programme Outcome-PO Courses Outcome-CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
CO1			*	*		*
CO2		*		*	*	*
CO3	*	*			*	
CO4			*	*		*
CO5			*	*		*
CO6		*		*	*	*
CO7	*	*			*	
CO8		*	*		*	
CO9	*	*			*	*
CO10		*	*	*		*
CO11		*		*	*	
CO12	*	*		*	*	
CO13		*	*	*	*	
CO14		*	*	*	*	*

M.Sc. CHEMISTRY SYLLABUS – REGULATION 2019



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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
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>10</b>	<b>21</b>
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
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>10</b>	<b>24</b>
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
	<b>Total</b>	<b>19</b>	<b>0</b>	<b>10</b>	<b>24</b>
<b>SEMESTER - IV</b>					
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
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>0</b>	<b>27</b>
	<b>Total Credits of this Program</b>				<b>96</b>

**DISCIPLINE SPECIFIC ELECTIVE COURSES –I**

<b>Semester</b>	<b>Elective No.</b>	<b>Course Code</b>	<b>Course Title</b>
I	I	19214DSC16A	a) Environmental Chemistry
		19214DSC16B	b) Supramolecular Chemistry

**DISCIPLINE SPECIFIC ELECTIVE COURSES –II**

<b>Semester</b>	<b>Elective No.</b>	<b>Course Code</b>	<b>Course Title</b>
II	II	19214DSC26A	a) Special Topics in Chemistry
		19214DSC26B	b) Macromolecules as Engineering Materials.

**DISCIPLINE SPECIFIC ELECTIVE COURSES –III**

<b>Semester</b>	<b>Elective No.</b>	<b>Course Code</b>	<b>Course Title</b>
III	III	19214DSC35A	a) Medicinal Chemistry
		19214DSC35B	b) Green Organic Synthesis: Principles and Applications

**DISCIPLINE SPECIFIC ELECTIVE COURSES –IV**

<b>Semester</b>	<b>Elective No.</b>	<b>Course Code</b>	<b>Course Title</b>
IV	IV	19214DSC43A	a) Nano Chemistry
		19214DSC43B	b) Material Chemistry



### OPEN ELECTIVE COURSES

<b>Semester</b>	<b>Course Code</b>	<b>Course Title</b>
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

<b>SEMESTER</b>	<b>SEC</b>	<b>GEC</b>	<b>DSE</b>	<b>RESEARCH</b>	<b>OTHERS</b>	<b>TOTAL</b>
I	19		04	01		<b>24</b>
II	19		04	05		<b>28</b>
III	19	03		02		<b>24</b>
IV			04	10	02	<b>16</b>
<b>TOTAL</b>	<b>57</b>	<b>03</b>	<b>12</b>	<b>18</b>		<b>92</b>

**SEMESTER – I**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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 - Addison 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  $^1\text{H}$  NMR spectroscopy,  $^{13}\text{C}$  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)
- Benzophenoneoxime 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

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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

- 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- $\pi$ , anion- $\pi$ ,  $\pi$ - $\pi$ , 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

E<sub>1</sub>,E<sub>2</sub>,E<sub>1</sub>CB mechanisms, Orientation of the double bond, Hofmann and Saytzeff rule, competition between elimination and substitution, dehydration and dehydrohalogenation reactions. Stereochemistry of E<sub>2</sub> 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  $\text{CrO}_3$  - 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, 2<sup>nd</sup> Edition, Chapman and Hall.



<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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 no 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. Douglas 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 , 4<sup>th</sup> Edition, ELBS, 1995
3. G. Friedlander, J.W. Kennedy and J.M. Miller, Nuclear and Radiochemistry
4. Keith F. Purcell and John. C. Kotz, Inorganic Chemistry, Saunders Golden Sunburst Series, W.B. Saunders Company, Philadelphia.
5. Cotton and Wilkinson, Advanced Inorganic Chemistry, 5<sup>th</sup> Edition, John Wiley & Sons, New York
6. W. Kaim 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. Keiter, Inorganic Chemistry; Principles of Structure and Reactivity, 4<sup>th</sup> 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.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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-physorption 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 biomolecular 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-distinguishable 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”, 2<sup>nd</sup> 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, 4<sup>th</sup> ed., Tata McGraw Hill(1994)
6. R.K.Prasad, quantum Chemistry, 2<sup>nd</sup> 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",  
2<sup>nd</sup> 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 <sup>1</sup>H NMR spectroscopy, <sup>13</sup>C 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

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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.



<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**

**2026**

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.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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 d<sup>n</sup> weak field cases. Tanabe-Sugano diagrams- characteristics – prediction and assignment of transition for weak field and strong field – d<sup>n</sup> 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 H<sub>2</sub>O, ClF<sub>3</sub>, NO<sub>3</sub>, ClO<sub>3</sub>. 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 <sup>1</sup>H, <sup>31</sup>P & <sup>13</sup>C) interpretation and applications to inorganic compounds. Effects of Quadrupole nuclei (<sup>1</sup>H, <sup>10</sup>B, <sup>11</sup>B) on the <sup>1</sup>H NMR spectrum. NMR paramagnetic molecules - isotopic shifts, contact and pseudocontact interactions- lanthanide shift reagents. Stereochemistry of non-rigid molecules, satellite spectra – Applications of <sup>31</sup>P, <sup>13</sup>C and <sup>1</sup>H 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- Cu<sup>2+</sup> in a tetragonal – field. Zero-field splitting and signal-affecting 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<sub>g</sub>, E<sub>g</sub> 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, 3<sup>rd</sup> Ed., ELBS Longman, London.
2. R.S. Drago, Physical Methods in Inorganic Chemistry, 3<sup>rd</sup> 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, 3<sup>rd</sup> Ed., ELBS, Great Britain, 1987.
6. C.N. Banwell, Fundamentals of Molecular Spectroscopy, 3<sup>rd</sup> 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, 2<sup>nd</sup> 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 9<sup>th</sup> ed,London 1985
2. J.N.Gurtur and R.Kapoor,'Advaced 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”

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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. Sawhney – 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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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 H<sub>2</sub>O, NH<sub>3</sub> and CH<sub>4</sub>. 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, 4<sup>th</sup> Edn., Tata Mc-Graw Hill(1994)
3. R.K.Prasad, Quantum Chemistry, 2<sup>nd</sup> Edn., New Age International Publishers(2000)
4. I.N.Levine , Quantum Chemistry, 4<sup>th</sup> 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, 2<sup>nd</sup> 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  $\alpha$  - 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.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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.



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**SCHOOL OF ARTS AND SCIENCE**

# Department of Microbiology

## **B.Sc. Microbiology Syllabus**

**[Regulation 2019]**

## SEMESTER I

19110AEC11	Tamil-I	4	0	0	2
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### முதல் பருவம் - தாள் - 1

#### 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 சரியில்லே

மு.மேத்தா - வாழையடி வாழை

வாலி - தாய்

#### அலகு - III

சிறுகதை - இளவேனிற் குழிப்புகள் - திருவையாறு பாலகுமார்

#### அலகு - IV

இலக்கணம்

எழுத்து

மண்பாடப்பகுதி

#### அலகு - V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை, புதுக்கவிதை

SKIL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111AEC11	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

**SKILDEVELOPMENT**

**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
19111AEC12	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 SKILDEVELOPMENT

**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
19116AEC13	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 SKILDEVELOPMENT

### **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  
SKILDEVELOPMENT

**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 <sup>th</sup> /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
19115AEC14B	Bio Chemistry I	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 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.  
SKILDEVELOPMENT

### **References:**

1. Fundamentals of Biochemistry – O.P. Agarwal
2. Essentials of Biochemistry – M.C. Pant
3. Essentials of Biochemistry – A.J. Jain
4. Principles of Biochemistry – Lehninger.
5. Text book of Biochemistry – West & Todd.
6. Harper's Biochemistry, 25<sup>th</sup> edn., McGraw Hill.

Course Code	Course Title	L	T	P	C
19116AEC15L	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.

1 Microscope and its operation

2 Cleaning of glassware's and sterilization methods – autoclaving and hot air oven

3 Preparation of culture media

4 Experimental demonstration of ubiquitous nature of microorganisms.

5 Quantitative estimation of microorganisms.

6 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 histolytica* and *Plasmodium Spp*)

7 Isolation of microorganisms from soil, water and air.

8 Test for motility of bacteria – Hanging drop method and semi solid media inoculation

9 Staining techniques – simple staining. Gram's staining, Spore staining, Capsular staining

### EMPLOYABILITY

Course Code	Course Title	L	T	P	C
19115AEC16BL	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.

1. Qualitative Analysis of Carbohydrate.

2. Qualitative Analysis of Proteins.

3. Colour Reactions for Amino Acids.

### **SKILDEVELOPMENT**

Course Code	Course Title	L	T	P	C
191ACLSICN	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. 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 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 SKILDEVELOPMENT

### **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



## SEMESTER II

Course Code	Course Title	L	T	P	C
19110AEC21	Tamil-II	4	0	0	2

### அலகு-I

திருநாசம்பந்தர் 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  
சிற்றிலக்கியம்.பள்ளு  
பிள்ளைத்தமிழ்  
பரணி

## SKILDEVELOPMENT

Course Code	Course Title	L	T	P	C
19111AEC21	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

SKILDEVELOPMENT

**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
19111AEC22	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

**SKILDEVELOPMENT**

**References:-**

Gathered Wisdom

-GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
19116AEC23	Microbial Physiology	6	1	0	6

### 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. SKILDEVELOPMENT

### Text Books:

- 1 Pelczar Jr. M.J. Chan E.C.S. and Kroig N.R.(1993). Microbiology – Mcgraw Hill Inc., New York

- 2 Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London
- 3 Murray R.K., Cranner M.D., Mayea P.A. and Rodwell V.W.(1990). Biochemistry-prentice Hall International Inc., London

**Reference:**

1. Holt J.S., Krieg N.R., Sneath P.H.A and Williams S.T.(1994). Bergey's Manual of Determinative Bacteriology(9<sup>th</sup> Edition) – Williams & Wilkins, Baltimore.
2. Brige E.A.(1992) Modern Microbiology – Wrn.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
19116AEC24L	Microbial Physiology Lab	0	0	3	2

#### **Aim**

- To impart the chemical characterization of microbes

#### **Objectives**

- It Gives brief description on the microbial metabolism and its energetic
- It deals with the various aerobic and anaerobic processes through which the organisms obtain and utilize the energy for their growth.
- Explains photosynthesis and photosynthetic bacteria

#### **Outcomes**

- The students will be able to understand and predict the various metabolic reactions in microbial cell.
- This will make them predict the intermediate products which can be employed in industrial production processes

1. Bacterial culture / isolation techniques, a streaking method, b. Pour plate method

2. Isolation and cultivation of fungi

3. Bacterial growth curve: cell count / viable count / absorbance (total count)

4. Carbohydrate fermentation test:

- Glucose
- Lactose,
- Maltose
- Sucrose
- Mannitol

5. Biochemical test for identification of Bacteria:

- Indole test
- Methyl red
- Voges – Proskaur test
- Citrate utilization
- TSI agar test
- Urease
- Catalase
- Oxidase

#### **Skildevelopment**

##### **Text Books:**

1. Pelezar Jr. M.J. Chan E.C.S. and Kroig N.R.(1993). Microbiology – Mcgraw Hill Inc., New York
2. Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London  
Pelczar, Jr. M.J.
3. Bucker, J.M. Caldwell, G.A., Zachgo, E.A. 1990. A Laboratory Course, Academic Press
4. Harold J.Benson, 1994. Microbial Applications, WM.C. Brown Publishers

Course Code	Course Title	L	T	P	C
19115AEC25	Bio Chemistry II	5	0	0	5

### **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**

- A candidate able to understand structures and functions of enzymes, proteins, carbohydrates, fats, process of metabolism.
- This course will provide clear understanding of Nucleic acid.

### **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. Employability

### **References:**

1. Principles of Biochemistry – Lehninger.
2. Cell Biology – DeRobertis and DeRobertis

3. Cell Biology – Rastogi
4. Cell Biology – C.B.Powar.
5. Biophysical Chemistry – Principles and techniques – Upadhayay, Upadhyay and Nath.
6. Principles and techniques of practical Biochemistry – Wilson & Walker.



Course Code	Course Title	L	T	P	C
19115AEC26L	Bio Chemistry II Lab	0	0	3	3

### **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**

- Students will get practical knowledge about various techniques used in Biochemistry

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.

### **SKILDEVELOPMENT**

### **References:**

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer

**Skill Based Elective-II**  
**MS-EXCEL**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC02AL	Package Lab-II	0	0	2	1

1. Prepare the addressing methods in excel
2. Describe the type of function
3. Draw a graph by using your own data
4. Prepare an Individual Pay Bill preparation for a employee in an organization.
5. Prepare a Mark list preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare a Inventory Preparation
8. Prepare a Electricity Bill Preparation

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Course Code	Course Title	L	T	P	C
19160SEC02B	Soft Skill II	0	0	2	1

### Part -II Self Development

#### 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  
skildevelopment

Course Code	Course Title	L	T	P	C
19111SEC02L	Communicative English Lab-II	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

skildevelopment

#### Reference

A Practical English Grammar  
English Grammar

-A.J Thomson and A.V.Martinet

-Wren and Martin

## SEMESTER – III

Course Code	Course Title	L	T	P	C
19110AEC31	Tamil-III	4	0	0	2

### அலகு-I

சிலப்பதிகாரம்-  
மணிமேகலை -  
சீவகசிந்தாமணி -

வழக்குரை காதை  
ஆதிரை பிச்சையிட்ட காதை  
நாட்டுவளம் 10 பாடல்கள்

### அலகு-II

பெரியபுராணம்-  
கம்பராமாயணம்

மெய்ப்பொருள் நாயனார் புராணம்  
-வாலி வதைப்படலம்

### அலகு-III

சீறாப்புராணம் -  
இயேசுகாவியம் -

கரம் பொருத்து படலம்  
மலைப்பொழிவு

### அலகு-IV

இலக்கணம்-  
மனப்பாடப்பகுதி

யாப்பு இலக்கணம்

### அலகு-V

இலக்கிய வரலாறு  
காப்பியங்கள்  
ஐஞ்சிறுகாப்பியங்கள்  
புராணங்கள், இதிகாசங்கள்

### SKILDEVELOPMENT

Course Code	Course Title	L	T	P	C
19111AEC31	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

**SKILDEVELOPMENT**

**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
19111AEC32	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 – 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

**SKILDEVELOPMENT**

**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
19116AEC33	Immunology	5	0	0	5

**Aim:**

- Designed to introduce the essential fundamentals of Immunology.

**Objectives**

- This course focuses on the concepts of immunology
- To create awareness on immunity
- To give knowledge on antigen and antibody
- To learn human diseases and vaccine

**Outcomes**

- The importance of Active and passive immunity, T and B cell significans, Immunoglobuline, complement components, Monoclonal antibodies, Major histocompatibility complex, vaccines.

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

Employability/Entrepreneurship/Skill development

**REFERENCES**

1. Charles A Janeway, Jr. Paul Travers, Mark Walport and Donald Capra J. Immunobiology – The immune system in health and disease, 4<sup>th</sup> edition, Current Biology Publications, London.1999.
2. Goldsby RA, Kindt TK, Osborne BA and Kuby J. Immunology, 5<sup>th</sup> edition,

- W.H. Freeman and Company, New York, 2007.
3. Ivan Roitt, Jonathan Brostoff and David Male. Immunology, 8<sup>th</sup> edition, Elsevier science Ltd., New York.2012.
  4. Kuby J. Immunology, 7<sup>th</sup> edition WH Freeman and company, New York. 2008.
  5. Playfair JHL. Immunology at a glance. 6<sup>th</sup> edition, Blackwell Science, London. 1996.
  6. Richard Hunt, Becker, Holger, Hlawatsch, Nadine, Julich, Sandra and Miethe Peter. Microbiology and Immunology Online. University of South Carolina.2004.
  7. Tak W Mak and Mary Saunders. Primer to the Immune Response. 2<sup>nd</sup> edition from Tak Mak, Mary Saunders, Bradley Jett. New York. 2014.
  8. Thomas J Kindt, Barbara A Osborne and Richard A Golds. Immunology online, University of South Carolina.2006.
  9. William E Paul. Fundamental Immunology. 7<sup>th</sup> revised edition, Raven press, New York. 2012.
  10. Sudha Gangal and Shubhangi Sontakke. Textbook of Basic and clinical Immunology, Universities Press, (India) Pvt. Ltd, Hyderabad, India. 2013.



Course Code	Course Title	L	T	P	C
19116AEC34L	Immunology Lab	0	0	3	3

### Aim

- To create the value on Immunology

### Objectives

- Acquire knowledge on medical experiments

### Outcomes

- Able to know about principles and techniques Blood grouping
- Understanding the immunological experiments for clinical field

### Lab work

1. ABO Blood Grouping
2. Rh typing
3. WIDAL Test
4. White Blood Cell Count
5. Red Blood Cell Count
6. Antigen preparation
7. Radial Immunodiffusion
8. Double Immunodiffusion
9. Demonstration of ELISA
10. Demonstration of RIA

Employability/Entrepreneurship

### References

1. O’Gorman, Manrice RG and Albert David Donnenberg. Hand book of human Immunology. Boca Raton, FL: CRC press, Francis.2008.
2. Rajan S and Selvi Christy R. Experiments in Microbiology. Anjana Books House, Chennai. 2015.

Course Code	Course Title	L	T	P	C
19112AEC35	Biostatistics	4	0	0	4

**Aim:**

- To represents an introduction to the field and provides a survey of data and data types.

**Objectives**

- Recognize and give examples of different types of data arising in public health and clinical studies
- Interpret differences in data distributions via visual displays
- Calculate standard normal scores and resulting probabilities

**Outcomes**

- Distinguish, calculate, and interpret measures of occurrence of diseases, including prevalence, incidence, risk, and odds of disease.

**Unit – I**

Use of statistics in biology – Measures of Central tendency – Mean, Median, Mode, Measure of dispersion Standard deviation – Standard error – Correlation Coefficient - Probability

**Unit – II**

Marginal conditional distribution – continuous and discrete distribution – Regression analysis – ‘t’ test, Chi-Square test, binomial, Normal and exponential, Biostat program.

**Unit – III**

Null hypothesis, level of significance, test of significance for mean / different

**Unit – IV**

Curve fitting – least square method – finite differences – difference operators – Newton’s forward and backward formula, Basics of the application of SPSS 7.5 window software package

**Unit – V**

MS Excel for computing data – Newton Raphson method, false position method – Solution of simultaneous algebraic equation.

**SKILDEVELOPMENT**

**Reference:**

1. Introduction to numerical methods 1990 S.Shasta
2. Computer Oriented numerical methods 1971 V.Rajaraman
3. Introduction to Biostatistics by Sokal and Rohit 1973 Toppan Co. Japan

Course Code	Course Title	L	T	P	C
19112AEC36L	Biostatistics Lab	0	0	3	3

**Aim:**

- To represent an introduction to the field and provide a survey of data and data types.

**Objectives**

- Recognize and give examples of different types of data arising in public health and clinical studies
- Interpret differences in data distributions via visual displays
- Calculate standard normal scores and resulting probabilities

**Outcomes**

- Distinguish, calculate, and interpret measures of occurrence of diseases, including prevalence, incidence, risk, and odds of disease.

1. Mean and Standard deviation using biological samples

2. Chi – Square test, Student ‘t’ test and Correlation coefficient

3. Regression Coefficient and regression lines

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19116RMC37	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 MATLAB platform for effective computational and graphic works required for quality research

**Outcomes:**

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.

**SKILDEVELOPMENT**

## Skill Based Elective-III

### POWER POINT

Course Code	Course Title	L	T	P	C
19120SEC03AL	PackageLab-III	0	0	2	1

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 a tourists places
8. Create a slide for calendar using appropriate text attributes and insert an object from a bitmap file

**SKILDEVELOPMENT**

Course Code	Course Title	L	T	P	C
19160SEC03B	SOFT SKILL III	0	0	2	1

### Part -III Interpersonal Relations and Social Responsibilities

#### 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.

SKILDEVELOPMENT

Course Code	Course Title	L	T	P	C
19111SEC03L	Communicative English Lab-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 –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

**SKILDEVELOPMENT**

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

- Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma

## SEMESTER – IV

Course Code	Course Title	L	T	P	C
19110AEC41	Tamil-IV	4	0	0	2

### அலகு-I

எட்டுத்தொகை  
நற்றினை - குறிஞ்சி 356,முல்லை-242, பாலை-397  
குறுந்தொகை- 2,18,25,58,67,69,135,167,283,373  
ஐங்குறுநூறு- சீறுவெண் காக்கைப் பத்து

### அலகு-II

கலித்தொகை- பாலை 34,குறிஞ்சி-51,நெய்தல்-133  
அகநானூறு - 36,147,332  
புறநானூறு- 34,173,189,235,279

### அலகு-III

முல்லைப்பாட்டு - முழுவதும்  
திருக்குறள்- ஐந்து அதிகாரம்-  
அறம் 2,பொருள் 2,இன்பம் -1 வான்சிறப்பு,அழக்காறாமை,இறைமாத்சி,கூடாநட்பு,காதற்சிறப்புரைத்தல்

### அலகு-IV

இலக்கணம் அணி

மனப்பாடப்பகுதி

### அலகு-V

இலக்கிய வரலாறு  
எட்டுத்தொகை  
பத்துப்பாட்டு  
அறஇலக்கியங்கள்

**SKILDEVELOPMENT**



Course Code	Course Title	L	T	P	C
19111AEC41	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. SKILDEVELOPMENT

**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
19111AEC42	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 SKILDEVELOPMENT

**References:-**

English for Enrichment

Selected Scenes from Shakespeare Book I &II

-.Devaraj Emerald Publishers

-Emerald Publishers

Course Code	Course Title	L	T	P	C
19116AEC43	Virology	6	0	0	6

**Aim:**

- To study the general aspects of viral morphology

**Objectives**

- To study general aspects of viral morphology and classification, replication, interactions and immunity to viruses
- To discuss the application of various immunological and molecular diagnostic tools.

**Outcomes**

- This paper will have clear understanding the role of various in plant, animal and human disease
- Candidate able to understand their various mechanisms to enter and escape from host.

**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.

**SKILDEVELOPMENT**

**Text book**

1. Dimmock N.J.Primrose S.B.(1994). Introduction to Modern Virology. IV edition. Blackwell scientific Publications, Oxford.
2. Topley & Wilson's(1990). Principles of Bacteriology, Virology and Immunity. VIII edition Vol.IV Virology, Edward Arnold, London.
3. Morag, C.Timbury(1994). Medical Virology. X edition. Chuuchill Livingston.

### **References**

4. Maloy S.R.Cronam Jr.J.E.Freifleder D. (1994). Microbial Genetics. Jones and Bartlett.Publishers.
5. Conrat., H.F.Kimball, P.C. and Levy, J.A.(1988). Virology. II Edition. Prentice Hall, Englewood cliff, New Jersey.
6. Harold J.Benson. 1994. Microbiological Applications. Wm.C.Brown Publishers, Melbourne, Austrialia.
7. James, C.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub. Co. California.

Course Code	Course Title	L	T	P	C
19116AEC44L	Soil Microbiology and Virology Lab	0	0	3	3

### Aim:

- To study the general aspects of virus

### Objectives

- To study general aspects of viral morphology and classification.
- Cultivation of viruses and various methods of propagation.
- To discuss the application of various immunological and molecular diagnostic tools

### Outcomes

- Upon paper completion, students will have knowledge on structure of plants, animal, bacteria and viruses.
- This paper also enables the student on isolation, propagation of various viruses.

### Lab work

1. Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes).

2. Isolation and staining of vesicular arbuscular mycorrhizae from roots of higher plants.

3. Isolation and testing of antagonistic microorganisms from soil

4. Isolation of microorganisms from Rhizosphere and Rhizoplane

5. Determination of soil pH

6. Estimation of soil chlorides.

7. Estimation of soil calcium.

8. Estimation of magnesium

9. Estimation total phosphorus.

10. Isolation & characterization of bacteriophage from natural resources.

### SKILDEVELOPMENT

### 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
19116AEC45	Bioinformatics	6	0	0	6

**Aim:**

- To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.

**Objectives**

- To make students understand the essential features of the interdisciplinary field of science- for better understanding biological data.
- To provide the student with a strong foundation for performing further research in- bioinformatics.

**Outcomes**

- Decipher the importance of bioinformatics.
- Master the aspects of protein-protein interaction, BLAST and PSI-BLAST.
- Describe the features of the databases of local and multiple alignments.
- Interpret the characteristics of phylogenetic methods and bioinformatics applications.

**Unit – I**

Introduction to Bioinformatics – Scope and application – Characteristics of Hardware and Software – Types of computer – Sending and receiving e-mails – Internet searching biological articles in internet

**Unit – II**

Computer application in biology – Information theory and biology – Analysis tools for databases – BLAST, FASTA and DNA database – NCBI, DDBJ and EMBL.

**Unit – III**

Protein structure determination by X- ray diffraction methods – Sequence alignment – Global alignment using Needleman – Wunsch algorithm and Local alignment using Smith – Waterman algorithm

**Unit – IV**

Application to DNA and protein sequence – Biochips, Biosensors.

**Unit – V**

Use of databases in biology: Sequence databases, structure databases. Sequence analysis – Protein and nucleic acids, Structure comparisons, molecular modeling, genome projects  
SKILDEVELOPMENT

**Reference:**

1. Molecular databases for protein sequence and structure studies by Silliance M and Silliance M 1991 Springer Verlag

2. Sequence Analysis primer by M.Gnibskov, J.Devereux 1989 Stockton press
3. Computational Methods in Mol.Biol/Now comprehensive Biochemistry Vol.32. S.C. Seizberg DB Searls, S.Kasif Elsevier 1998.
4. Comutational methods for macromolecular analysis 1996 methods in Enzymology Vol.266 by R.F. Dorlitttle Academic press.

Course Code	Course Title	L	T	P	C
19116AEC46L	Bioinformatics Lab	0	0	3	3

**Aim:**

- To learn about the bioinformatics databases, databanks and data format data retrieval from the online sources.

**Objectives**

- To make students understand the essential features of the interdisciplinary field of science for better understanding biological data.

**Outcomes**

- Search the literature data of the given protein using PubMed.
- Search the nucleotide sequence data of the given species using NCBI / EMBL / DDBJ.
- Search the protein sequence of the species using PIR and Swissprot / UniProt.

1. Pairwise alignment using FASTA, BLAST.

2. Multiple alignments using Clustal W.

3. Study of internet resources in Bioinformatics – NCBI, ENBL, EBI.

**SKILDEVELOPMENT**



**Skill Based Elective IV**  
**MS-ACCESS**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04AL	Package Lab-IV	0	0	2	1

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the universality exams
3. Create a database for sorting the date of joining by the employee in the organization.
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 employee database

**SKILDEVELOPMENT**

Course Code	Course Title	L	T	P	C
19160SEC04B	SOFT SKILL IV	0	0	2	1

## PART -IV Etiquette And Interviewing Skills

### **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.

**SKILDEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111SCE04L	Communicative English Lab-IV	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

**SKILDEVELOPMENT**

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

-Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma

## ENVIRONMENTAL STUDIES (for under graduate students)

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

### 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.

### 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.

### 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 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.

### SKILLDEVELOPMENT

#### 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](mailto: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, Crnbridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, VJvI. 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) Paryavarana shastra — Gholap T.N,
- 23) Paryavarana 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.

## SEMESTER V

Course Code	Course Title	L	T	P	C
19116AEC51	Food and Dairy Microbiology	5	0	0	5

### Aim:

- To learn about the epidemiology of foodborne diseases and the pathogens.

### Objectives

- To learn about food spoilage factors
- To know the preservation methods
- To make aware of food borne disease

### Outcomes

- Better understanding of cause of microbes in food spoilage
- Get information regarding food preservation
- Enable them to work food fermentation industries

### 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. Employability/Entrepreneurship/Skill development

### Text Book

1. Adams, M.R. and Moss, M.O.1995. Food Microbiology, The Royal Society of Chemistry, Cambridge.
2. Frazier, W.C. and Westhoff, D.C.1988. Food Microbiology, TATA McGraw Hill Publishing company ltd., New Delhi.
3. Jay, J.M.1987. Modern Food Microbiology. CBS Publishers and distributors, New Delhi.
4. Atlas, R.M. 1989. Microbiology, A Fundamentals and Applications, Macmillian Publishing company.

### Reference:

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
19116AEC52	Molecular Biology	5	0	0	5

**Aim:**

- To introduce the fundamentals and basic biology of life.

**Objectives**

- To learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- To understand causal relationships between molecule/cell level phenomena (“modern” genetics) and organism-level patterns of heredity (“classical” genetics)
- To test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations

**Outcomes**

- It will elaborate the central dogma of the cell i.e., gene expression viz. transcription and translation in both prokaryotes and eukaryotes.

**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

#### EMPLOYABILITY

#### Text Book

1. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM. 1987. Molecular Biology of the Gene. The Benjamin/Cummings publishing company.
2. Lewin B.1994. Genes V.Oxford University press.
3. Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J. 1995. Molecular Cell Biology. Scientific American Books.
4. Freifelder D. 1991 Molecular Biology. Narosa Publishing Home
5. R.S.Old and S.B.Primrose. 1989. Principles of Gene Manipulation, 4th Ed., Blackwell Scientific Publications, London.

#### Reference

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
19116AEC53	Agricultural and Environmental Microbiology	4	1	0	3

**Aim:**

- To learn about microorganisms in environment

**Objectives**

- To know the role of microbes in environmental field
- To get information on aquatic Microorganism

**Outcome**

- Students acquire the information about microbes
- Know about microbes and its role in environment.
- Able to understand about microbes in agriculture and environmental field

**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.

Employability/Entrepreneurship/Skill development

**Text Book:**

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, VolIII, 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. William M., Lewis Jr.James. F.Saunders. David W.Crumpacker. Sr. and Charles Brebdecke., 1994. Ecologica Studies – Vol 46.
6. Bernt Zeitzschel, Sebastian A.Gerlach 1973. The Biology of Indian Ocean. Ecological studies. Vol.III
7. W.Nybakken, 1982. Marine Biology – An Ecological Approach. Ames Harper and Row Publisher, New York.
8. K.C.Marshall, 1985. Advances in Microbial Ecology. Vol-8. Plenum press.
9. Burns, R.C. and Slater, J.H. 1982. Experimental Microbial Ecology – Blackwell Scientific Publications, Oxford, London.

Course Code	Course Title	L	T	P	C
19116AEC54L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	3

### Aim:

- To analyze results for routine microbiological samples.

### Objectives

- Apply analyses used commonly in the food industry.
- Correctly predict the types and levels of organisms commonly occurring in different foods.
- Clearly communicate in different oral and written formats, to different audiences, the results of laboratory analyses in food microbiology.

### 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
- Employability/Entrepreneurship/Skill development

### 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.

Course Code	Course Title	L	T	P	C
19116AEC55L	Agricultural and Environmental Microbiology Lab	0	0	3	3

### Aim:

- To use appropriate lab techniques and analyze results for routine microbiological samples

### Objectives

- To know the role of microbes in environmental field
- To get information on aquatic Microorganism

### Outcome

- Students acquire the information about microbes
- Know about microbes and its role in environment

### Lab work

1. Isolation and culturing of *Rhizobium* from root nodules.
2. Isolation and culturing of *Azospirillum* from grassplant.
3. Isolation and culturing of *Azotobacter* from paddy field
4. Isolation and culturing of *Phosphobacter* from paddy field
5. Isolation and culturing of Blue Green Algae from paddy field
6. Isolation and identification of air-borne bio-particles using Open plate method
7. Effects of high salt concentration on microbial growth
8. Microbial flora of polluted water – Microbial flora of sewage
9. Bacterial examination of drinking water by membrane filter technique and MPN

### EMPLOYABILITY

## Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
19116DSC56A	Proteomics	5	0	0	4

### Aim

To acquaint the students to the versatile tools and techniques employed in proteomics.

### Objectives

- To illustrate creative use of modern biology linked with proteomics.
- To expose students to importance of proteomics
- To learn different approach and types of proteomics.

### Outcome

Students acquire huge knowledge in protein functional and expressions, Gel based and Non gel based proteomics.

### Unit I

Introduction to protein structure, Chemical properties of proteins. Physical interactions that determine the property of proteins. Short-range interactions, electrostatic forces, Van der Waal interactions, hydrogen bonds, hydrophobic interactions.

### Unit II

Proteomics: structural, functional, expression, interaction proteomics. Importance of proteomics. Determination of protein sizes (Sedimentation analysis, gel filtration, SDS-PAGE); Native PAGE,

### Unit III

Protein-protein interactions, gel based proteomic tools e.g. 2D, DIGE, Non-gel based proteomic tools, Gel based proteomics, LC-based proteomics.

### Unit IV

Protein array, Protein Identification and data evaluation, Identification of post-translational modifications: Phosphorylation, Glycosylation, Acetylation

### Unit V

Mass Spectrometry-Fundamental parameters: Mass accuracy, Resolution, Sensitivity, Ion sources: Electrospray ionization, Matrix assisted laser desorption and ionization. Peptide mass finger printing, Tandem mass spectrometry

Employability/Entrepreneurship/Skill development

## Reference Book

1. Hartl, Daniel L., Jones, Elizabeth W. "Genetics: Analysis of Genes and Genomes". Jones and Bartlett Publishers: Boston, 2005.
2. Weaver, Robert F. "Molecular Biology, 2nd Edition". McGraw Hill: Boston, 2002.
3. Colinge, Jacques and Keiryn L. Bennett. "Introduction to Computational Proteomics". PLoS Comput Biol. 2007 July; 3(7): e114.
4. Graves, P. R., T. A. J. Haystead. "Molecular Biologist's Guide to Proteomics". Microbiology and Molecular Biology Reviews: Vol.66 No.1, 2002.
5. van Wijk, K. J. "Challenges and Prospects of Plant Proteomics". Plant Physiol. 2001 June; 126(2): 501-508.



Course Code	Course Title	L	T	P	C
19116DSC56B	Bioinoculants	5	0	0	4

**Aim:**

- To introduce students to basic characteristics of microorganisms (morphology, cytology, metabolism), their ecologies and importance for life cycles in the nature, for plants growing, animal husbandry and processing of plant and animal products.

**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**

- Students acquire knowledge in microbial preparates, enzymes, and secondary metabolites in agricultural practices.

**UNIT – I**

General account of the microbes used as a biofertilizers for crop plants and their advantages. Symbiotic N<sub>2</sub> fixers: Rhizobium- Isolation, characterization, identification, classification, inoculum, production and field application. Frankia- Isolation, characterization- actinorrhizal nodules-non-leguminous crop symbiosis.

**UNIT – II**

Non-symbiotic N<sub>2</sub> fixers-Azospirillum-Free living-Azotobacter-free isolation, characterization, mass inoculum production and field application.

**UNIT – III**

Symbiotic N<sub>2</sub> 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.

Employability/Entrepreneurship/Skill development

**Reference:**

- Kannaiyan, S. (2003). Biotechnology of Biofertilizers, CHIPS, Texas.
- Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth press, Inc. New York.
- Reddy, S. M. et al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.
- Subba rao N. S (1995). Soil microorganisms and plant growth. Oxford and IBH publishing co. Pvt. Ltd. New delhi.
- Subba rao N. S (1998). Biofertilizers in Agriculture and forestry. Oxford and IBH publishing co. Pvt. Ltd. New delhi.

**Skill Based Elective V**  
**PHOTO SHOP**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Marks</b>
<b>19120SEC05AL</b>	<b>PackageLab-V</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>100</b>

1. Design a Visiting card.
2. Design a Identity card.
3. Design a letter pad with LOGO.
4. Create an advertisement for News paper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

Employability/Entrepreneurship/Skill development

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC05B	SOFT SKILL V	0	0	2	1

### **PART -V Leadership Skills and Body Language**

#### **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  
Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19111SEC05L	Communicative English Lab-V	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

**UNIT –V**

Acronyms

Concord

SKILDEVELOPMENT

**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

## SEMESTER VI

Course Code	Course Title	L	T	P	C
19116AEC61	Industrial Microbiology	4	0	0	5

### **Aim:**

- To train students practically in basic principles of food and industrial microbiology.

### **Objectives**

- It also emphasis to learn about the production of various fermented products and field trip to dairy, food industries, sewage treatment plants.

### **Outcomes**

- Students acquire hands on training various microbes of industrial importants

### **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.

Employability/Entrepreneurship/Skill development

### **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. Mannuall of Industrial Microbiology and Biotechnology. ASM Press
2. Reed. G. 1982. Prescott and Dunn's Industrial Microbiology. Macmillian 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
19116SEC62	Clinical Microbiology	4	0	0	4

**Aim:**

- To understand about the pathogenic microbes

**Objectives**

- To inculcate on the role of normal flora and pathogenic microbes
- To understand the pathogenesis of various diseases
- To understand the various clinical microbiological techniques.

**Outcomes**

- Get information about various mechanisms of infection
- Knowledge on clinical lab techniques
- Acquire knowledge on control measures of diseases

**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.

**EMPLOYABILITY**

**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.

Course Code	Course Title	L	T	P	C
19116AEC63L	Industrial Microbiology Lab	5	0	0	3

**Aim:**

- To train students practically in basic principles of food and industrial microbiology.

**Objectives**

- It also emphasis to learn about the production of various fermented products and field trip to dairy, food industries, sewage treatment plants.

**Outcomes**

- Students acquire hands on training various microbes of industrial importants

**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**

Preparation of fermented food –cheese

Employability/Entrepreneurship/Skill development



Course Code	Course Title	L	T	P	C
19116SEC64L	Clinical Microbiology Lab	0	0	3	3

**Aim:**

- To provide technical knowledge on collection and processing of clinical samples

**Objectives**

- To prepare them to work in clinical laboratory 3. To learn the technique for isolation and identification of pathogens

**Outcomes**

- Get practical knowledge in specimen collection and processing
  - Become technically expert which will helpful to work in clinical laboratory
  - Able to identify clinical pathogens
1. Examination of parasitic ova and cysts from faecal samples.
  2. Identification of pathogenic organism with a smear, culture and biochemical test
  3. *Staphylococcus sp, E.coli, Klebsiella sp, and Salmonella typhi*

**Demonstration**

1. LP Mount - *Trichophyton sp. Microsporum sp*

**Spotters:**

2. Slides of pathogenic bacteria, fungi and parasites:
  3. Electron micrographs of viruses – Pox viruses, Herpes simplex virus, HIV, HBV,
    - *Staphylococci*
    - *Streptococci*
    - *Mycobacterium leprae*
    - *Trypanema pallidum*
    - *Leptospira sp.*
    - *Bacillus subtilis*
    - *Klebsiella sp.*
- *E.coil.*
  - *Clostridium tetani.*
  - Permanent mounts of dermatophytes
  - *Candida sp.*
  - *Cryptococcus sp.*
  - *Maduromycetes.*

Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19116DSC65A	Recombinant DNA Technology	4	0	0	4

### Aim

To acquaint the students to the versatile tools and techniques employed in recombinant DNA technology.

### Objectives

- To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences
- To expose students to application of recombinant DNA technology in biotechnological research.
- To train students in strategizing research methodologies employing genetic engineering techniques.

### Outcome

- Students acquire knowledge in gene cloning, plasmid and target DNA isolation, genomic and cDNA library

#### Unit -I

History and achievements of rDNA technology. Nomenclature, classification of Restriction Endonucleases - ligases, types - gene cloning in prokaryotes - Expression and cloning strategies. Construction of genomic library and cDNA library.

#### Unit II

Restriction enzymes - restriction analysis of genomes- restriction sites- cloning of blunt end DNA, adapters. DNA analysis: labeling of DNA and RNA probes. Southern and fluorescence *in situ* hybridization, DNA fingerprinting, chromosome walking.

#### Unit- III

Gene transfer Techniques - Physical - Biolistic method, Chemical - Calcium chloride and DEAE methods, Biological invitro pakage method - Screening and selection of recombinants.

#### Unit-IV

Microbial synthesis of commercial products - Insulin, Interferons, Human growth hormone, antibiotics, biopolymers.

#### Unit- V

Transgenic Plants - Ti plasmid, insect resistant plant. Transgenic animal - mice - retroviral method- DNA microinjection method. PCR methods and its applications.

#### EMPLOYABILITY

#### REFERENCES

1. Mitra (2005). Genetic engineering. Published by Macmillan India Ltd., Chennai.
2. JogdandSN (2005). Gene biotechnology. Himalaya Publishing House, Mumbai.
3. Satyanarayana (2005). Biotechnology. First edition, Books and Allied (P) Ltd., Kolkata.
4. Preeti Joshi (2002). Genetic engneermg and its application. First edition, Agrobios (India).
5. Dubey RC (2005). A Text of Biotechnology. Multicolour Illustrative edition, S.Chand and Company Ltd., New Delhi.

Course Code	Course Title	L	T	P	C
19116DSC65B	Bioethics	4	0	0	4

**Aim:**

- To recognise and identify ethical dilemmas in a clinical encounter
- To analyse an ethical dilemma and come to a conclusion

**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
- Can develop and teach a curriculum in Bioethics for their field of medicine

**Outcomes**

- Students will identify ethical issues in a research proposal and suggest appropriate methods to ensure ethical conduct of biomedical research

**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? EMPLOYABILITY

**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, 5<sup>th</sup> edition, Oxford University Press. 2000.

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

**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

**SKILDEVELOPMENT**

**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

**SKILDEVELOPMENT**

**References**

1. P.A.Navanitham, Business Mathematics & Statistics
2. 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. SKILDEVELOPMENT

**Books for Study**

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

**Books for Reference:**

2. A Course In Electrical And Electronic Measurements and Instrumentation – A.K. Sawhmey – Dhanpat Rai and Sons – 1990.

3. 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.

**SKILDEVELOPMENT**

**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
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.

**SKILDEVELOPMENT**

**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 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.

SKILDEVELOPMENT

**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.

**SKILDEVELOPMENT**

**Reference Books:**

Income Tax Law and Practice - N.Hariharan.  
Business Taxation – T.S.Reddy/Hari Prasad Reddy.



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## **SCHOOL OF ARTS AND SCIENCE**

Department of Microbiology

**M.Sc. Microbiology Syllabus**

**[Regulation 2019]**

Course Code	Course Title	L	T	P	C
19216SEC11	Prokaryotic Microbiology	6	1	0	5

## AIM

**Prokaryotes** are important to all life on earth and play a critical role in the recycling of nutrients by decomposing dead organisms and allowing their nutrients.

## OBJECTIVES

- To explore cell structure and morphology in prokaryotes.
- To gain more experience using the microscope.
- To obtain a better understanding of prokaryotes

## 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 T<sub>4</sub> 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 **Employability/Entrepreneurship/Skill development**

### 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 <sup>th</sup> /1993	Tata McGraw-Hill, Inc, New york
2.	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3 <sup>rd</sup> / 2003	Chand Publishing

### Reference Book:

1. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
19216SEC12	Eukaryotic Microbiology	6	1	0	5

### AIM

- To describe the basic structures and essential characteristics of eukaryotic cells

### OBJECTIVES

- Students will understand the structures and purposes of basic components of eukaryotic cells, especially macromolecules, membranes, and organelles.
- To generate and utilize energy in cells

### 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

Employability/Entrepreneurship/Skill development

### Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
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1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 <sup>th</sup> /1993	Tata McGraw-Hill, Inc, New york
2	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3 <sup>rd</sup> / 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
19216SEC13	Microbial Physiology	6	1	0	4

**AIM:**

- Microbial physiology has traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.

**OBJECTIVES:**

- To understand the major goal of Microbial Physiology and Metabolism is to assist students in rapidly communicating their research and education.
- The overall function is studied through analysis of the cellular response to different environmental conditions.

**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 – Pilli, 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 – induct on 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 – bacterochlorophyll – rhodopsin – carotenoids – phycobiliproteins: Carbohydrates – anabolism – autotrophy – oxygenic – anoxygenic photosynthesis – autotrophic generation of ATP; fixation of CO<sub>2</sub> – Calvin cycle – C<sub>3</sub> – C<sub>4</sub> pathways. Chemolithotrophy – sulphur – iron – hydrogen – nitrogen oxidations – Brief account of methanotrophs in relation to CO<sub>2</sub> 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.

Employability/Entrepreneurship/Skill development

#### 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 <sup>th</sup> /1993	Tata McGraw-Hill, Inc, Newyork
2.	S. Meenakumari	Microbial physiology	1 <sup>st</sup> / 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
19216SEC14L	Fundamentals of Microbiology Lab	0	0	4	2

## AIM

- To impart knowledge of the **basic principles** of microbiology

## OBJECTIVES

- The goals for this laboratory course is to provide the students with a basic fundamental knowledge of how microorganisms grow, react with specific types of growth media and their biochemical reactions with media used in identification.
- Laboratory procedures are used to show students to learn the vital techniques.

## 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

Principles and methods and sterilization – (Wet, dry and cold sterilization)

Direct microscopic observations of bacterial shape – cocci, rods, chains, fungal spores, mycelium, yeast budding.

Preparation of Media: Nutrient broth, Nutrient agar, plates, slants, soft agar. Pure culture technique: Streak plate, spread plate and pour plate methods

Measurement of size of microbes – micrometry method. Motility determination – Hanging drop method.

Isolation and purification of cyanobacteria, actinomycetes, fungi and protozoans.

Staining methods: Simple, Negatives, acid fast, Gram staining, Capsule Metachromatic granular staining, Lactophenol cotton blue staining – Fungal slide preparation.

Measurement of growth – Direct haemocytometer count, viable count – growth curve,

Determination of growth rate and generation time.

Effect of pH, temperature and osmotic pressure on growth of bacteria.

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

Blood grouping

Widal test

Total count of RBC

Total count of WBC

Differential count of WBC

Erythrocyte Sedimentation Rate

Preparation of Buffer; pH measurement (Tris, phosphate, acetate buffer)

## SKILDEVELOPMENT

### Reference:

1. Cappuccino and James, G(1996) Microbiology a laboratory manual, Addison Wesley Publishing company Inc. 4<sup>th</sup> 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
19216DSC15A	Immunotechnology	5	0	0	4

### AIM:

- Immunotechnology is a diverse and growing discipline that can be defined as the study of the tissues, cells and molecules involved in host defense mechanisms

### OBJECTIVES:

- To understand how the immune system develops, how the body defends itself against disease, and what happens when it all goes wrong.

### 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, Immunoelectrophoresis, 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.

### SKILDEVELOPMENT

## Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Ivaitt Roitt, Jonathan Brostoff, David Male	Immunology	3 <sup>rd</sup> /1993	Mosby Inc, St. Louis, MO
2.	R.A. Goldsby, T. J. Kindt, B.A. Osborne, J. Kuby	Immunology	5 <sup>th</sup> /2003	W.H. Freeman and Company
3.	M.S. Aslam	Immunobiology	1 <sup>st</sup> /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
19216DSC15B	Bioremediation and Waste Management	5	0	0	4

#### AIM

- To reduce pollutant levels to undetectable, nontoxic or acceptable levels.

#### OBJECTIVES:

- The **bioremediation** technology offers the potential to treat contaminated soil and groundwater on-site without the need for excavation and thus, it requires little energy input and preserves the soil structure.

#### 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.

## SKILDEVELOPMENT

### 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
19216SEC21	Industrial Microbiology	5	1	0	5

### AIM

To create **industrial** products in mass quantities, often using **microbial** cell factories.

### OBJECTIVE

- There are multiple ways to manipulate a microorganism in order to increase maximum product yields.
- To learn complete knowledge on upstream and downstream processing.

### COURSE OUTCOME

CO1- Students will get knowledge on strain improvement.

CO2- Enable them to work in fermentation industry.

CO3- Students will get idea on upstream and downstream fermentation process

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,

### 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 <sup>nd</sup> /1990	Sinauer Associates Incorporated
3.	Prescott and Dunn's	Industrial Microbiology	4 <sup>th</sup> /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 Biotechnology. 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
19216SEC22	Environmental and Agricultural Microbiology	5	1	0	5

### AIM

To address problems in environmental agricultural practices in microbial communities.

### OBJECTIVES

- To understand the role of Microbes, especially bacteria, are of great importance in the sense that their symbiotic relationship (either positive or negative) have special effects on the ecosystem.
- To improve soil fertility, such as microbial degradation of organic **matter** and soil nutrient transformations.

### 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.

Employability/Entrepreneurship/Skill development

### Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	B. Nagamani	Soil And Agricultural Microbiology	1 <sup>st</sup> / 2007	Margham Publications
2.	Dirk, J., Elsas, V., Trevors, J.T., Wellington	Modern Soil Microbiology	1997	Marcel Dekker INC
3.	<b>R.R. Mishra</b>	Soil Microbiology	1 <sup>st</sup> /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
19216SEC23	Clinical Microbiology	5	0	0	4

### AIM

To introduce basic principles and application the relevance of **clinical** disease.

### OBJECTIVE

To learn bacteria, viruses and other pathogens related with infectious diseases in humans.

### 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) Diphtheria 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.

Employability/Entrepreneurship/Skill development

### Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Sherris	Medical Microbiology	4 <sup>th</sup> /2004	McGraw-Hill Companies, Inc.
2.	V.V. Kale, K.P. Bhusari	Applied Microbiology (Pharmacy and other Bioscience)	1 <sup>st</sup> /2001	Himalaya Publishing House
3.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5 <sup>th</sup> /1993	Tata McGraw-Hill, Inc, Newyork

### References

- 1 Schachter, M., Med off, G. and Eisenstein, B.C.(1993) mechanism disease, 2<sup>nd</sup> 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. Medowlealf PressL shildon, England
- 4 Stokes,J., Ridway, G.L., and Wren, M.W.D.,(1993). Clinical Microbiology 7<sup>th</sup> Edn. Arnold a division of Hodder and Stoughton.
- 5 Wistriench, G.A. And lechtonan, M.D.(1988). Microbiology, 5<sup>th</sup> Edn., Mac publishing company NY
- 6 Atlas, R.M. (1989) Microbiology – fundamentals and applications 2<sup>nd</sup> Edn. Maxwell Mac Millan International Edition

Course Code	Course Title	L	T	P	C
19216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	4	2

### AIM

To provide technical knowledge on collection and processing of industrial, clinical and environmental samples.

### OBJECTIVE

- To test specimens from patients for microorganisms
- To prepare them to work in clinical laboratory.
- To learn the technique for isolation and identification of pathogens.

### COURSE 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

1. Citric acid fermentations by *Aspergillus niger*
2. Alcoholic fermentation of fruit juice by yeast (*Saccharomyces cerevisiae*).
3. Immobilization techniques using any microbe- alginate beads
4. Hydrolysis of starch
5. Testing sensitivity of bacteria to antibiotics and Assessing minimum inhibitory concentration(MIC) of antibiotics
6. Isolation and identification of certain pathogenic microbes from urine
7. Hemoglobin content of blood
8. Serum analysis, sugar analysis in blood and urine

### Agricultural and Environmental Microbiology

1. Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes)
2. Isolation and staining of vesicular arbuscular mycorrhizae from plant.
3. Isolation and culturing of Rhizobium from root nodules of higher plant
4. Mushroom cultivation
5. Isolation and identification of air-borne microbes
6. Effects of high salt concentration on microbial growth
7. Determination of BOD and COD of polluted/pond water.
8. 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

### SKILDEVELOPMENT



**Reference:**

1. Clescri,L.S., Greeberg,A.E., and Eaton, A.D.(1998) Standard Methods for Examination of Water and Waste Water, 20<sup>th</sup> 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. Pactricia Cuning(1995) Official Methods of Analysis, Vol I and II, 16<sup>th</sup> 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
19216DSC25A	Biomolecules	5	0	0	4

### AIM

To teach students about important biomolecules essential to life processes.

### OBJECTIVES:

- To learn the principles of organic chemistry in the structure and function of important biomolecules.
- To understand the structure and function of important biological molecules such as DNA, RNA and some enzymes.
- To understand biological processes such as protein biosynthesis, DNA replication and RNA biosynthesis.

### COURSE 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  $\alpha$ -helix,  $\beta$ -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.

## SKILDEVELOPMENT

### Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	J. L. Jain	Fundamentals of Biochemistry	1 <sup>st</sup> / 2005	S. Chand and Company

### References

- Biochemistry Dubay 4th edition William C.Brown Publication, 1998.  
Biochemistry. Davidson and Sittmann, NMS 4th ed. Lippincott William's and Wilkins, 1999  
Biochemistry – Voet and Voet. J O H N WI VP & *Publisher* Kaye Pace Associate Publisher, 2011.  
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
19216DSC25B	Genomics and Proteomics	5	0	0	4

## AIM

To monitor the properties of the entire complement of proteins from a given cell or organism,

## OBJECTIVES:

To gain the knowledge and analyze the varying proteomes of an organism at different times in order to highlight differences between them.

## 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.

## SKILDEVELOPMENT

### References

- Gupta, P.K. 2004. Biotechnology and Genomics. First edition. Rastogi Publications, Meerut.
- Miglani, G.S. 2007. Advanced Genetics. New Delhi: Narosa Publishing House.
- Primrose, S.B. and Twyman, R.M. 2006. Principles of Gene Manipulation and Genomics. Blackwell Publishing, Australia.
- Singh, B.D. 2009. Biotechnology: Expanding Horizons. Second Edition. Kalyani Publishers, Ludhiana.
- Singh, B.D. 2009. Plant Biotechnology. Kalyani Publishers, Ludhiana.
- Thompson, J.D., Schaeffer-Reiss, C., and Ueffing, M. 2008. Functional Proteomics. Methods and Protocols. Humana Press, New York.
- Twyman, R.M. 2004. Principles of Proteomics. Taylor & Francis.

Course Code	Course Title	L	T	P	C
19216RMC26	Research Methodology	3	0	0	2

**AIM:**

To systematically solve a research problem

**OBJECTIVES:**

- To learn and practice the literature survey aspects of projects and prepare the scope and goal of the proposed project.
- To learn, practice, improve the research presentation skill.

**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**

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:**

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**

**Text Books**

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	C. R. Kothari	Research Methodology	2 <sup>nd</sup> / 2004	New age international publishing (p) Ltd.

2.	S. Rajkumar	Research Methodology	1 <sup>st</sup> / 2008	Anuradha Publication
3.	Jerrold H. Zar	Biostatistical Analysis	4 <sup>th</sup> /2003	Pearson Education (Singapore) Pte. Ltd.
4.	D. J. Homie and Hazel Peck	Analytical Biochemistry	3 <sup>rd</sup> / 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, 2<sup>nd</sup> Edition 1999.
3. Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3<sup>rd</sup> 1999.
4. Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2<sup>nd</sup> 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
19216SEC31	Microbial Genetics	6	1	0	6

#### AIM

- To study the gene transfer from one organism to another.

#### OBJECTIVE

- To understanding molecular biological studies, the manipulation of eukaryotic organisms, and for practical applications (biotechnology) in diverse areas of life sciences.
- To provide relatively simple system for studying **genetic** phenomenon and thus useful to other higher organisms.

#### COURSE 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)

#### Employability/Entrepreneurship/Skill development



## 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 <sup>nd</sup> /1990	Narosa Publishing House
3.	William S. Klug, Michael R. cummings	Concept of Genetics	7 <sup>th</sup> /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, 4<sup>th</sup> edition, Benjamin / Cummings Publishing Company.

Course Code	Course Title	L	T	P	C
17216SEC32	Microbial Biotechnology	6	1	0	6

## AIM

- To adapt the **microbial** metabolism, so that the product is produced at maximum theoretical yield, whereas also ATP is produced to support growth and maintenance.

## OBJECTIVES

- To develop industrial processes for production of antibiotics, enzymes etc.
- To develop gene surgery and gene therapy to cure genetic disease.
- To create improved varieties of plants and animals through genetic engineering and plant breeding.

## 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. **Employability/Entrepreneurship/Skill development**

**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
19216SEC33L	Microbial Genetics and Biotechnology Lab	0	0	5	3

**AIM:**

- To understand the **microbial genes**, genomes, and gene expression and evolution of microorganisms and their interactions with the environment.

**OBJECTIVES**

- To provide 'hands-on' experience in the investigation and manipulation of microorganisms and their **genes**.
- To develop the ability to think critically and devise **genetic** strategies that might be used to address interesting biological problems.

**OUTCOMES**

CO1- Has acquired a fairly good knowledge of the tools and the methods for genetic engineering

CO2- Separation of DNA and Protein by gel electrophoresis.

CO3- Students can perform isolation of DNA, amplification of any gene by PCR

CO4- Hands on experience on Molecular genome isolation and identification techniques

**Experiments**

1. Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
2. Isolation of chromosomal DNA from bacteria by Agarose gel electrophoresis.
3. Development of competent cells in *E. coli*.
4. Separation of protein by SDS PAGE
5. Isolation of antibiotic resistant auxotrophic mutants.
6. Separation of proteins using Column chromatographic techniques (Gel filtration).
7. Immobilization techniques – alginate beads.
8. Estimation of citric acid and ethanol. SKILDEVELOPEMENT

**DEMONSTRATION**

1. Gel Electrophoretic methods.
2. UV transillumination

Course Code	Course Title	L	T	P	C
19216SEC34A	Plant Tissue Culture	5	0	0	4

### AIM

- To understand the knowledge on culturing **plant** seeds, organs, explants, tissues.

### OBJECTIVE

- To understanding the basic process of preparing media for plant tissue culture.
- To learn micronutrients, macronutrients and organic elements.

### COURSE OUTCOME

CO1- To inculcate the basics of plant tissue culture

CO2- To impart the knowledge about the various aspects of tissue culture and their applications

CO3- Learn the role of micro and macro- nutrients in tissue culture plantation.

### 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. Protoplast fusion - 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.

## SKILDEVELOPMENT

## 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. Hammond, 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* (2<sup>nd</sup> 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
19216SEC34B	Nanotechnology	5	0	0	4

## AIM

- To provide basic knowledge in the interface between chemistry, physics and biology on the nanostructural level with a focus on biotechnological usage.

## OBJECTIVE

- Nanoscience is the study of materials which are in nanoscale range. Conversion of any material in nanoscale results in alteration of its physicochemical, biological, mechanical, optical, electronic, etc. properties.
- To learn advance research and promoting innovation through applications of nanobiotechnology to address issues in health, energy, agriculture and environment.

## COURSE OUTCOME

CO1- Describe the basic science behind the properties of materials at the nanometre scale

CO2- Advanced experimental and computational techniques for studying nanomaterials.

CO3- Learn clearly and effectively using conventional scientific and mathematical notation.

CO4- Systematically solve scientific problems related specifically to nanotechnological materials.

### 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.

#### **SKILDEVELOPMENT**

#### **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. 1<sup>st</sup> 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.

## SEMESTER IV

Course Code	Course Title	L	T	P	C
19216SEC41	Pharmaceutical Microbiology	6	1	0	6

### AIM

To ensure safety and efficacy of **pharmaceutical** products.

### OBJECTIVES

To test and ensure sterility, determine effectiveness, contamination or bioburden, analyze toxins (exotoxin or endotoxin) of the drugs.

### COURSE OUTCOME

CO1- Acquired detailed knowledge of antimicrobial agents, their mechanism of action.

CO2- Developed understanding of different types of disinfectants/antiseptics bactericidal and bacteriostatic actions

CO3- Regulatory practices, biosensors and applications in Pharmaceuticals.

CO4- Quality Assurance and Validation.

### 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.

Employability/Entrepreneurship/Skill development

### **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
19216SEC42	Biostatistics and Bioinformatics	6	1	0	6

### AIM

To provide the statistical, analytical and computational training

### OBJECTIVES

To advance statistical science and its application to problems of human health and disease, with the ultimate goal of advancing statistics.

To designing studies and analyzing data from research problems.

### COURSE OUTCOME

CO1- Learn about probability/variable analysis and collection, classification of data

CO2- Basic ideas of significance test (T-test, ANOVA)

CO3- Understanding about the information on the search engines and various software tools

CO4- Scope of Biological databases related software used in the bioinformatics

### 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.

### Employability/Entrepreneurship/Skill development

#### 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 <sup>st</sup> /2003	Viva Books Private Limited
2.	S. Sundara Rajan, R. Balaji	Introduction to Bioinformatics	1 <sup>st</sup> /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.
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### 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
19216SEC43L	Pharmaceutical Microbiology Lab	5	0	0	4

### AIM

To provide a knowledge and understanding of **pharmaceutical microbiology** relevant to healthcare

### OBJECTIVES

To gain the knowledge on culture and identification of microorganism, 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

### SKILDEVELOPMENT

Course Code	Course Title	L	T	P	C
19216SEC44A	Bioethics and IPR	5	0	0	4

### AIM

- To understand Bioethics and Human Rights in order to assist their application and promotion in the areas of science

### OBJECTIVES

- To encourage investigation, analysis and studying the **bioethical** principles, values, concepts, and social and juridical implications contained in the Universal Declaration on **Bioethics**.

### COURSE OUTCOME

CO1- Students will gain awareness about *Intellectual Property Rights (IPRs)*

CO2- To take measure for the protecting their ideas

CO3- Able to develop business strategies by taking account of *IPRs*

CO4- Able to assists in technology up gradation and enhancing competitiveness.

## 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.**SKILDEVELOPMENT**

### **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](http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html)
6. [www.patentoffice.nic.in](http://www.patentoffice.nic.in)
7. [www.iprlawindia.org/](http://www.iprlawindia.org/) - 31k - Cached - Similar page

Course Code	Course Title	L	T	P	C
19216SEC44B	Molecular Immunology	5	0	0	4

## AIM

- To learn **immunological** response at the **molecular**, cellular and functional levels of innate and acquired **immunity**. It includes immune regulation, cell signaling and Immunochemistry.

## OBJECTIVES

- To identify the cellular and **molecular** basis of immune responsiveness.
- To describe the roles of the immune system in both maintaining health and contributing to disease.
- To understanding of humoral and cellular **immunity** and their relative significances.

## COURSE OUTCOME

CO1 - Able to identify the cellular and molecular basis of immune responsiveness.

CO2- Learn about Biosensor assays for assessing ligand –receptor interaction.

CO3- Rationale for vaccine design about new generation antibodies

CO4- Multi-gene organization of immunoglobulin gene

### 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<sup>+</sup> 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.

Skildevelopment.

#### **Text Books**

1. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2011. Essential Immunology 12<sup>th</sup> Edition. Wiley - Blackwell.
2. Charles A Janeway, Jr. Paul Travers, Mark Walport, and Mark J Shlomchik. 1999. Immunobiology. 4<sup>th</sup> Edition. Journal of Current Biology publications.
3. D. M. Weir and John Stewart. 1997. Immunology. 8<sup>th</sup> Edition. Churchill Livingstone.
4. P.J.Delves, I S.J.Artn, I D.R.Burton and I.M.Roitt. 2006. Essential Immunology. 11<sup>th</sup> Edition. Wiley - Blackwell.
5. Richard M. Hyde. 2012. Microbiology and Immunology. 3<sup>rd</sup> Edition. Springer Science & Business Media.

#### **Reference Books**

1. Brostoff J, Seaddin JK, Male D and Roitt IM., 2002. Clinical Immunology. 6<sup>th</sup> Edition. Gower Medical Publishing.
2. Paul William E. 1999. Fundamental of Immunology. 4<sup>th</sup> Edition. Lippencott Raven.
3. E Roitt. 2011. Essential Immunology. 12<sup>th</sup> Edition. Blackwell Publication.



Course Code	Course Title	L	T	P	C
19211OEC	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 SKILDEVELOPEMENT.

**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
19212OEC	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

**SKILDEVELOPEMENT**

**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
19213OEC	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.

**SKILDEVELOPEMENT**

**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
19214OEC	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 CO<sub>2</sub> - 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

**SKILDEVELOPEMENT**

**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
19220OEC	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.

## SKILDEVELOPEMENT

## 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 Code	Course Title	L	T	P	C
19261OEC	Open Elective-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.

**Outcome:**

- 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.

**SKILDEVELOPMENT**

**Reference Books:**

- Dr.MR.Mishra – Law of Insurance – Central Law Agency Allahabad  
 Dr.M.M.Verma & R.K.Agarwal – Insurance  
 Pandey & Ratogi – Insurance  
 M.N.Mishra & S.Chand - Principles and Practice of Insurance

Course Code	Course Title	L	T	P	C
19280OEC	Open Elective-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

**Outcome:**

- 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

**SKILDEVELOPMENT**

**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



<b>Course Title</b>
<b>Financial Service</b>

## 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.

## 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

## SKILDEVELOPMENT

## 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.



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**SCHOOL OF ARTS AND SCIENCE**

**DEPARTMENT OF MICROBIOLOGY**

**M.PHIL., MICROBIOLOGY SYLLABUS**

**REGULATION 2019**

## **DEPARTMENT OF MICROBIOLOGY**

### **M.PHIL., MICROBIOLOGY**

#### **PROGRAM OUTCOME**

PO 1 - Recognize and think critically towards the science curricula with sound knowledge and theoretical skills by questioning and plausible explanations.

PO2 - Motivate themselves and develop an interest in planning and implementation of research

PO 3 - Handle equipments needed for material preparation, characterization and to analyze and interpret the data with theoretical background and software.

PO 4 -Practice the teaching-learning process by being the proponent in classroom and laboratory experience

PO 5 - Apply the scientific context to develop innovative ideas, products and methods for the benefits of biosphere

PO 6 - Adopt changes in the environment with high integrity and transpire ethical professionals

PO 7 - Recognize and integrate life-long learning skills to become pro-active in personal and professional live

PO 8 - Opt for careers demanding writing and communicative skills locally and globally

#### **PROGRAMME SPECIFIC OUTCOME**

PSO 1 - Critically evaluate the basic information and ideas from various fields of microbiology.

PSO 2 - Developing skilled persons in the sector of Disease diagnosis, treatment and prevention.

PSO 3 - To integrate the knowledge microbes and improving the quality of life through sustainable microbiological applications.

PSO 4 - To train the students to develop, design and apply research projects independently to accommodate them in research.

PSO 5 -To encourage the students to do original research that ends up in new technological or process application.

PSO 6 -To enrich the Graduates with solid fundamentals of microbiology and advanced technologies.

PSO 7 - To equip the students to identify, define and solve the emerging problem.

PSO 8 - Make the student to understand complex ethical and professional issues to accommodate them in Industry and/or Institutes, to better placement.



**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMILNADU

**DEPARTMENT OF MICROIOLOGY**

**M.PHIL MICROBIOLOGY SYLLABUS - REGULATION 2017**

**COURSE STRUCTURE**

<b>SEMESTER – I</b>					
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>193RMG11</b> (Common Paper)	Research Methodology	2	2	0	2
<b>193MBC12</b>	Advanced Microbiology	2	2	0	2
<b>193MBE13_</b>	A. Microbial Biotechnology	2	2	0	2
	B .Bioprocess and Enzyme Engineering				
<b>CPE_RPE</b> (Common Paper)	Research and Publication Ethics	2	2	0	2
	<b>Total</b>	<b>08</b>	<b>08</b>	<b>00</b>	<b>08</b>
<b>SEMESTER - II</b>					
<b>193MBC21</b>	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)

Course Code	Course Title	L	T	P	C
203__ _11	Research Methodology	2	2	0	2

#### 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/Entrepreneurship/Skill development**

#### **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)

## PAPER II - ADVANCED MICROBIOLOGY

Course Code	Course Title	L	T	P	C
203MBC12	Advanced Microbiology	2	2	0	2

### Course Outcome

CO1: To learn about microbial taxonomy and molecular characterization of microbes

CO2: To Learn about applications of microbes in research aspects

CO3: To Gain the knowledge about biotechnological engineering concept in research

CO4: To Learn immune system and its mechanism

CO5: To gain knowledge about nanotechnology and synthesis of nano-particles from microbes.

### Unit I:

Prokaryotic and eukaryotic microbial diversity – bacteria, cyanobacteria, microalgae, microfungi, Habitats, nutrition, ultrastructure and mode of reproduction. Isolation, cultivation and preservation of microorganisms. Classification - Haeckel's three kingdom concept. Whittaker's five kingdom concept. Three domine concept of Carl Woese. Classification of bacteria according to Bergey's manual of determinative bacteriology. Criteria for classification and identification of microorganisms – morphological, physiological & biochemical. Numerical taxonomy. Phage typing. Nomenclature – bacteriological code. Introduction - DNA finger printing – RFLP, Plasmid profiles, G+C content. Importance of 16S rRNA in taxonomy & phylogeny.

### Unit II:

Basic concepts in medium design – design procedure growth limiting nutrient in designed medium – cell growth and product formation – immobilization and cell culture – cell immobilization – enzyme immobilization. Microbes involved in biodegradation of organic wastes and xenobiotic compounds – heavy metals, pesticides, insecticides. Bioinsecticides – BT toxin. Microbial leaching – Extraction of metals from ores. Biofuels, Microbial hydrogen production. biodegradation of oils and petroleum products.

### Unit III:

Diagnostic Immunology- methods for immunoglobulin determination – Quantative and qualitative antigen and antibody reactions. Agglutination – precipitation Immunoflourescence, Immunoblotting, Immunometric methods, Immunology of transplantation and malignancies. Enzyme immunoassays, flow cytometry- Assessment of human allergic diseases-Molecular

methods- HLA typing- Immunohaematology- transfusion and compatibility testing, Transfusion reactions. Chemiluminescent detection of proteins.

#### **Unit IV:**

Introduction to molecular biology – DNA and RNA – composition and structure. DNA replication, Recombination and repair – Transcription and Translation, Regulation of gene expression. PCR based finger printing – RT PCR, 16S rDNA amplification, cloning, transformation, DNA sequencing. RAPD, STRR & LTRR, Blotting and hybridization. DNA Microarrays/Chips. Genome sequence comparison, alignment and data base searching. GenBank – NCBI, EMBL & DDBJ – retrieving sequences. Tools used for phylogenetic analysis – Ribosomal Database Project, FASTA, BLAST, Phylip. RNA structure prediction, Restriction enzyme patterns. Designing primers & probes. DNA barcoding. Submission of rDNA sequences – Bankit & Sequin guidelines.

#### **Unit V:**

History of nanobiotechnology; Terminologies of nanobiotechnology; Nanoparticles; Nanotubes; Nanowires; Silver nanoparticles. Protein functions at the cellular level. biosensors; drug delivery, and tissue engineering. Microbial growth response to inorganic nanoparticles; Nanoparticle internalization and cytotoxicity; Nano curcumin(Polymeric nanoparticle-encapsulated curcumin) – a novel strategy for human cancer;Therapeutic application of gold nanoparticles.

#### **Employability/Entrepreneurship/Skill development**

#### **References:**

1. Danial Lim ,1998, Microbiology, McGrawHill Companies , New York
2. Stanbury, P.F., A.Whitaker and S.J.Hall. 1995. Principles of fermentation technology- Elsevier Publications
3. Edward A. Birge ,1992, Modern Microbiology, Principles and application. Wm.C.Brown Publishers,USA.
4. HH Rashidi & LK Buehler (2002). Bioinformatics Basics: Applications in Biological Science and Medicine, CRC Press, London
5. Nanobiotechnology II: More Concepts and Applications (2007) by Chad A. Mirkin, Christof M. Niemeyer 1st edition Wiley-VCH Publisher.
6. NanoBiotechnology Protocols (Methods in Molecular Biology) (2005) by Sandra J



Rosenthal, David W. Wright Humana press publisher.

7. Nanobiotechnology Molecular Diagnostics: Current Techniques and Applications (Horizon Bioscience) (2006) by K.K. Jain Taylor & Francis 1st edition. Taylor & Francis Publication.

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Course Code	Course Title	L	T	P	C
203MBC13A	Microbial Biotechnology	2	2	0	2

### Course Outcomes

CO1: To gain Knowledge about isolation, purification and preservation of microorganisms.

CO2: To learn about the molecular tools of genetic engineering

CO3: To Know about the production of value added products

CO4: To gain the knowledge about industrial production from microbes.

CO5: To learn the methods of biofertilizer and biofuels production

### Unit I:

Historical development of microbial technology. Products obtained from microorganism through recombinant techniques. Introduction to genetic engineering. Molecular tools of genetic engineering- vectors-Methods of gene transfer. Gene cloning strategies. Basic techniques in genetic engineering.

### Unit II:

Biotechnology & Bioprocess Engineering, steps in bioprocess development, Microbial culture, Screening and selection for fermentation processes; Preservation and improvement of industrially important microorganisms, Strain development. Fermentation Material and Energy balance, Microbial growth kinetics: Microbial growth cycle, measurement of growth, Batch culture, continuous culture, fed-batch culture, applications and examples. . Bioinstrumentation and computer control of fermentation processes. Bioreactors - Solid State fermentation - Submerged fermentation. Downstream processing of industrial products

### Unit III:

Bacteriology and starter rotations, improving starter cultures for food fermentation by genetic manipulation, recombination technology. Genetic improvement of lactic starters to enhance their technological functions for industrial applications e.g. acid, flavour, EPS, probiotic functions, Metabolic engineering of lactic acid bacteria, Production of recombinant dairy / food enzymes / proteins e.g. Chymosin, lactoferrin, lysozyme, lipases, proteases, etc. Single Cell Protein

### Unit IV:

Microbial products of pharmaceutical value – raw materials, organism and Industrial processes involved in the Microbial production of antibiotics - Penicillin, Cephalosporins, Aminoglycosides, Tetracycline and aromatic antibiotics, Enzymes , Vitamins - B12, Riboflavin, aminoacids and Recombinant vaccines.

#### **Unit V:**

Soil microbes and fertility of soil. Role of microbes in biogeochemical cycles Microbial association – beneficial – nitrogen fixing organism – symbiosis, asymbiosis, associate symbiosis – bacteria actinomycetes, cyanobacteria – mycorrhizae –phosphate solubilizers. Nitrogen fixation and role of Ti plasmids in biotechnology: Biology of nitrogen fixation – nitrogen fixation genes and their regulation in *Klebsiella* – *Rhizobium* – *Azospirillum* & *Azotobacter* – *Agrobacterium* and plant tumour – Ti plasmids Ri plasmids – Genetic regulation of tumorigenicity in plants. Production of Biofertilizer

#### **Employability/Entrepreneurship/Skill development**

#### **References:**

1. Textbook of Microbiology - Ananthanarayanan and Jayaram panikar. Seventh Edition 2005
2. Microbiology - Pelczar, Chan and Krieg 5<sup>th</sup> Edition 1993 Reprint 2015. Tata Mc Craw Hill
3. Biotechnology - U. Sathyanarayana Eleventh Edition 2017

### PAPER III - BIOPROCESS AND ENZYME ENGINEERING

Course Code	Course Title	L	T	P	C
203MBC13B	Bioprocess and Enzyme Engineering	2	2	0	2

#### Course Outcome

CO 1- To understand different fundamentals concepts and specialized knowledge of different applied microbiology area

CO 2 - To apply the knowledge gained in developing industrial enzyme products.

CO 3- To become an entrepreneur through this industrial based learning strategies

CO 4 -To start an independent research and can contribute in solving new problems faced in current science

#### Unit-I

Bioprocesses- batch, fed-batch and continuous cultivation, sterile operations, design of experiment for bioprocess optimization, industrial synthetic biology, high throughput bioprocess design, bioseparation and downstream processing- membrane separation techniques, chromatographic separation techniques, water purification etc., interactions and integration of microorganisms, bioreactor and downstream processing, experimental basis and methods for biosystems analysis, modelling of bioreactors, dynamic behaviour of bioprocesses, analysis, modelling and simulation of biological networks.

#### Unit-II

Development of reactors and processes for stabilization of organic and industrial wastes, miniaturisation of bioreaction systems, miniplant technology for integration of biosynthesis and downstream processing, technical and economic assessment of bioproduction processes, application of bioinformatics for development of bioprocesses, biocatalysis for the sustainable synthesis of chemicals and pharmaceuticals from renewable resources, rational engineering of biological systems for sustainable bioprocessing, small mimics, microfluidics and mathematical models for process understanding, scale-translation.

#### Unit-III

Strain improvement – Applications of mutation, Recombination and DNA Technology.– Principles and applications, enzymology of process. Industrial enzymes production - Proteases, amylases, lipases, cellulases, pectinases, glucose isomerase, L-Asparaginase.

#### Unit - IV

Kinetics of enzyme reactions, biochemical characterization of enzymes, graphical analysis of kinetic data, pH and temperature dependence, development of recombinant clones for overproduction of enzymes and metabolites, development of expression systems in bacteria and yeasts, bioenergetics and biological molecular machines, protein conformation study and structure-function relationship using biophysical methods, protein engineering by combinatorial methods.

#### Unit-V

Enzyme engineering and design: substitution, insertion, hybrid proteins, genes for novel enzymes Aequorin and Enviropig, directed evolution and site directed mutagenesis approaches to improve industrial enzymes, engineering more stable enzymes, analysis and design of microbial and enzyme reactors for production of industrially important products such as biofuels, industrial enzymes, biopolymers, etc., development of bio-sensors for detection of various analytes, development of cell culture techniques for cultivation of plant and animal cells in specialized reactors for production of therapeutic compounds.

#### **Employability/Entrepreneurship/Skill development**

#### Reference

Yoo YJ et al (2017) Fundamentals of Enzyme Engineering, Springer 2.

Stanbury et al (2003) Principle of Fermentation technology, Butter worth-Heinemann

## PAPER IV - 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.
2. Metrics: h-index, g index, i10 index, altmetrics.

## **Employability/Entrepreneurship/Skill development**



SCHOOL OF ARTS AND SCIENCE  
DEPARTMENT OF ENGLISH  
2019 – 2020

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

B.A ENGLISH LITERATURE - REGULATION 2019  
COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19110AEC11/ 19111AEC11/ 19132AEC11/ 19135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I)	4	0	0	2
19111AEC12	English-I	4	0	0	2
19111AEC13	Literature in 1400-1600 Period	4	0	0	4
19111AEC14	Literature in Elizabethan Period	4	0	0	4
19111AEC15	Social History of England-I	5	0	0	4
19111AEC16	History of English Literature-I	5	0	0	4
191__SEC01__	Skill Based Elective-I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>Total</b>	<b>27</b>	<b>0</b>	<b>3</b>	<b>23</b>
<b>SEMESTER II</b>					
19110AEC21/ 19111AEC21/ 19132AEC21/ 19135AEC21	Language-II (Tamil-II/ Advanced English-II/ Hindi-II/ French-II)	4	0	0	2
19111AEC22	English-II	4	0	0	2
19111AEC23	Literature in Jacobean Period	4	0	0	4
19111AEC24	Literature in Restoration Period	4	0	0	4
19111AEC25	Social History of England-II	5	0	0	4
19111AEC26	History of English Literature-II	5	0	0	4
19111RLC27	Research Led Seminar	-	-	-	1
191__SEC02__	Skill Based Elective –II	0	0	2	1



19111SEC02L	Communicative English Lab-II	0	0	2	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>4</b>	<b>23</b>
	<b>SEMESTER III</b>				
19110AEC31/ 19111AEC31/ 19132AEC31/ 19135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
19111AEC32	English-III	4	0	0	2
19111AEC33	Literature in Augustan Period	4	0	0	4
19111AEC34	Literature in Romantic Period	4	0	0	4
19111SEC35	Literary Forms and Prosody	4	0	0	4
19111AEC36	Shakespeare	3	0	0	3
19111RMC37	Research Methodology	3	0	0	3
191__SEC03__	Skill based Elective- III	0	0	2	1
19111SEC03L	Communicative English Lab-III	0	0	2	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>4</b>	<b>24</b>
	<b>SEMESTER IV</b>				
19110AEC41/ 19111AEC41/ 19132AEC41/ 19135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
19111AEC42	English-IV	4	0	0	2
19111SEC43	Language and Linguistics	4	1	0	5
19111AEC44	Literature in Victorian Period	4	0	0	4
19111AEC45	Literary Criticism	6	0	0	6
19111AEC46	Indian and European Classics in Translation	3	0	0	3
191__SEC04__	Skill based Elective- IV	0	0	2	1
19111SEC04L	Communicative English Lab-IV	0	0	1	1
191ENVTSTU	Environmental Studies	1	0	0	1
	<b>Total</b>	<b>26</b>	<b>1</b>	<b>3</b>	<b>25</b>
	<b>SEMESTER V</b>				
19111AEC51	Literature in Modern Period-I	4	0	0	4
19111AEC52	American Literature	5	0	0	5
19111SEC53	English Language Teaching	5	1	0	6
19111SEC54	Translation	5	1	0	5
19111DSC55__	Discipline Specific Elective – I	5	0	0	4
19111BRC56	Participation in Bounded research	-	-	-	2
191__SEC05__	Skill based Elective- V	0	0	2	1
19111SEC05L	Communicative English Lab-V	0	0	2	1
	<b>Total</b>	<b>24</b>	<b>2</b>	<b>4</b>	<b>28</b>
	<b>SEMESTER VI</b>				
19111AEC61	Literature in Modern Period-II	4	0	0	4
19111AEC62	Indian Writing in English	5	0	0	5
19111AEC63	Commonwealth Literature	5	0	0	5
19111DSC64__	Discipline Specific Elective –II	5	0	0	4

191__OEC	Open Elective	4	0	0	2
19111PRW66	Project Work	-	-	-	4
191__SEC06	Skill based Elective- VI	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	2	1
19111EXACT	Extension Activities	-	-	-	1
19111PEE	Programme Exit Examination	-	-	-	2
	<b>Total</b>	<b>23</b>	<b>0</b>	<b>4</b>	<b>29</b>
	<b>Total Credits for the Programme</b>				<b>152</b>

#### Discipline Specific Electives

Semester	Discipline Specific Elective Courses
V	a) 19111DSC55A-Single Author Study-Tagore b) 19111DSC55B-Single Author Study-Oliver Goldsmith
VI	a) 19111DSC64A-Study of a genre-Poetry b) 19111DSC64B-Study of a genre-Novel

#### Open Electives

Semester	Open Elective Courses
V	a) 19112OEC-Development of Mathematical Skills b) 19113OEC-Instrumentation c) 19114OEC-Food and Adulteration d) 19117OEC-Mushroom Technology e) 19120OEC-Web Technology f) 19122OEC-E-Commerce and its application g) 19161OEC-Indirect Taxes

#### Skill based Electives

Semester	Skill based Elective Courses
I	a) 19120SEC01AL-Package Lab – I b) 19160SEC01B-Soft skill – I
II	a) 19120SEC02AL-Package Lab – II b) 19160SEC02B-Soft skill – II
III	a) 19120SEC03AL-Package Lab –III b) 19160SEC03B-Soft skill – III
IV	a) 19120SEC04AL-Package Lab –IV b) 19160SEC04B-Soft skill – IV
V	a) 19120SEC05AL-Package Lab –V b) 19160SEC05B-Soft skill - V
VI	a) 19120SEC06AL-Package Lab –VI b) 19160SEC06B-Soft skill – VI

**B.A. ENGLISH LITERATURE SYLLABUS -REGULATION 2019  
SYLLABUS  
SEMESTER – I**

Course Code	Course Title	L	T	P	C
19110AEC11	Tamil-I	4	0	0	2

DEPARTMENT OF TAMIL 2019

SEMESTER – I

Semester	Subject Code	Title of the Course
I	19110AEC11	இக்கால இலக்கியம்,செய்யுள்,சிறுகதை,இலக்கணம்,இலக்கிய வரலாறுமையடங்குதல்

முதல் பகுதி - தாள் - 1

**அலகு - I**

**பாதிப்பர் தேர்ப்புட்டிப் பட்டிகள்**

- கதத்திர்ப் பெருமை
- கதத்திர்ப் பட்டி
- கதத்திர தேவியின் துதி
- தொண்டு செய்யும் அடிமை

**பாதித்தாள்**

- வீரத்தாய்

**அலகு -II**

**சுதா** - நல்ல தீர்ப்பு

**கண்ணதாசன்** - கத்தல் துணியின் கதை

**பட்டுக்கோட்டை கல்பாணசுத்தரம்** - நண்டு செய்த தொண்டு - காலம் சரியில்லே

**முடித்தாள்** - வாழ்ப்பு வாழை

**வாலி** - தாய்

**அலகு - III**

**சிறுகதை** - இளவேலிற் குறியுடன் - திருவையாறு பாலகுமார்

**அலகு - IV**

**இலக்கணம்**

**எழுத்து**

மையடங்குதல்

**அலகு - V**

**இலக்கிய வரலாறு**

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை,புதுக்கவிதை

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC11	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
- 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

**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

**EMPLOYABILITY**

Course code	Course Title	L	T	P	C
19111AEC12	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**

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

**References:-**

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan  
Emerald Publishers

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC13	Literature in 1400-1600 Period	4	0	0	4

**Aim:**

- To acquaint the students 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
- Recognise, interpret and 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**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC14	Literature in Elizabethan Period	4	0	0	4

**Aim:**

- To acquaint the students with the different forms of literature during Elizabethan period

**Objective:**

- To let the students 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:**

- Understand British Literature in Elizabethan period
- Recognise, interpret and explain the connections between their own experiences and the world using 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
19111AEC15	Social History of England-I	5	0	0	4

**Aim:**

- To acquaint the students with a total picture of the English so

**Objective:**

- To know the socio economic aspects from fourteenth century to eighteenth century

**Outcome:**

- Ethical, social and professional understanding

**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

**References:-**

English Social History -G.M Trevelyan The English Language Book Society & Longmans

The Social History of England -Xavier

A Social History of England -A.N Johri

A Social History of England -Dr. Raman

**EMPLOYABILITY/ SKILL DEVELOPMENT**



Course Code	Course Title	L	T	P	C
19111AEC16	History of English Literature-I	5	0	0	4

**Aim:**

- To acquaint the students 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 the English society
- Ethical, social and professional understanding

**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

**References:-**

History of English Literature -Hudson

History of English Literature -Trivedi

**EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC01A	Skill Based Elective -I Package Lab-I	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

### **EMPLOYABLITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC01B	Skill Based Elective -I Soft Skill -I	0	0	2	1

## **Effective Communication**

### **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.

### **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC01L	Communicative English Lab-I	0	0	1	1

**Aim:**

- To acquaint with the basic grammar and develop language skills

**Objective:**

- To know English grammar and all the concomitant linguistic items
- To learn about the auxiliary and the models
- To understand the types of sentences and its patterns
- To enrich vocabulary
- To familiarize with the features, process, forms and barriers of communication
- To enhance listening skill

**Outcome:**

- Understand grammar
- Develop listening skill

**UNIT –I**

Parts of speech

**UNIT – II**

Kinds of Sentences, Patterns of sentences

**UNIT – III**

Auxiliaries, Modals

**UNIT –IV**

Communication-Characteristics-Process-Forms-Barriers-Types

**UNIT-V**

Listening-benefits-types-good listener-active and passive listening-effective listening

**Lab Note-1.** Word Mentor - Level I Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, Listening activity from Globarena

Software 2. Vocabulary diary

**Viva**-Listening activity

**Exam components**-Theory-50+MCQ online exam-vocabulary-20+Viva-15+Lab note-15=100

**References:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
191INDCONS	Indian Constitution	1	0	0	1

**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 Indianconstitution**

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.

**EMPLOYABILITY/ SKILL DEVELOPMENT**

## SEMESTER – II

Course Code	Course Title	L	T	P	C
19110AEC21	Tamil-II	4	0	0	2

### SEMESTER – II

Semester	Subject Code	Title of the Course
II	19110AEC21	செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி

#### 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 அடிப்படுத்தல் இன்பமே  
பெரியாழ்வார் - 1 பாசரம் - திருப்பல்லாண்டு - தாலப்பருவம்  
நாச்சியார் திருமொழி - 10 பாடல்கள்- ஆறாம் திருமொழி

#### அலகு-III

சிற்றிலக்கியம் ,  
முக்கூட்டுப்பள்ளு - வளமை, செழுமை  
மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ்- தாலப்பருவம்-ஐந்துபாடல்கள்

#### அலகு-IV

இலக்கணம் - சொல்  
மனப்பாடப்பகுதி

#### அலகு-V

இலக்கிய வரலாறு  
சைவ, வைணவ இலக்கியங்கள்  
சிற்றிலக்கியம் பள்ளு  
பிள்ளைத்தமிழ்  
பரணி

## EMPLOYABILITY

Course Code	Course Title	L	T	P	C
19111AEC21	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

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC22	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	-Gowri Sivaraman Emerald Publishers
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**EMPLOYABILITY**



Course Code	Course Title	L	T	P	C
19111AEC23	Literature in Jacobean Period	4	0	0	4

**Aim:**

- To know the English literary history in Jacobean Period

**Objective:**

- To learn British Literature in Jacobean period

**Outcome:**

- Understand British Literature in Jacobean period
- Recognise, interpret and explain the connections between their own experiences and the world using the texts

**UNIT I**

Valediction Forbidding Mourning - John Donne

The Retreat - Henry Vaughan

**UNIT II**

The Pulley - George Herbert

The Garden - Andrew Marvell

**UNIT III**

L'ilegro - 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
19111AEC24	Literature in Restoration Period	4	0	0	4

**Aim:**

- To acquaint the students with the socio, religious aspects of the Restoration period

**Objective:**

- To learn how the literary world had repelled against the preceding period and how it finds expression in the literature of the Restoration period.

**Outcome:**

- Understand British Literature in Restoration period
- Recognise, interpret and explain the connections between their own experiences and the world using the texts

**UNIT I**

Mac Flecknoe -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
19111AEC25	Social History of England-II	5	0	0	4

**Aim:**

- To acquaint the students 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:**

- Ethical, social and professional understanding

**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

**References:-**

English Social History -G.M Trevelyan The English Language Book Society & Longmans

The Social History of England -Xavier

A Social History of England -A.N Johri

A Social History of England -Dr. Raman

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111AEC26	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 the English society
- Ethical, social and professional understanding

**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

**References:-**

History of English Literature

-Hudson

History of English Literature

-Trivedi

**EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC02A	Skill based Elective-II Packages Lab-II	0	0	2	1

### **MS –EXCEL**

1. Prepare the addressing methods in excel
2. Describe the type of function
3. Draw a graph by using your own data
4. Prepare an Individual Pay Bill preparation for a employee in an organization.
5. Prepare a Mark list preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare a Inventory Preparation
8. Prepare a Electricity Bill Preparation

### **EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC02B	Skill Based Elective -II Soft Skill -II	0	0	2	1

## **Self Development**

### **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

## **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC02L	Communicative English Lab-II	0	0	2	1

**Aim:**

- To acquaint with the basic grammar and develop language skills

**Objective:**

- To understand the different tenses and use it in sentences
- To form sentences
- To know subject verb agreement
- To enrich vocabulary
- To read and comprehend the context

**Outcome:**

- Understand grammar
- Develop reading skills

**UNIT-1**

Tenses-Simple, Perfect

**UNIT -II**

Tenses-Continuous, Perfect continuous

**UNIT -III**

Forming sentences-positive, negative and questions

**UNIT -IV**

Concord

**UNIT -V**

Reading-benefits-purpose-techniques-types-Effective reading

**Lab Note-1.** Word Mentor - Level II Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, Reading activity from Globarena Software 2. Newspaper Article notebook

**Viva-**Reading activity

**Exam Components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**References:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

**EMPLOYABILITY/ SKILL DEVELOPMENT**

## SEMESTER – III

Course Code	Course Title	L	T	P	C
19110AEC31	Tamil-III	4	0	0	2

### SEMESTER – III

Semester	Subject Code	Title of the Course
III	19110AEC31	செய்யுள் - காப்பியங்கள், இலக்கணம், இலக்கிய வரலாறு, மண்பாட்பகுதி

#### அலகு-I

சிலப்பதிகாரம்-  
மணிமேகலை -  
சீவகசிந்தாமணி -

வழக்குரை காதை  
ஆதிரை பிச்சையிட்ட காதை  
நாட்டுவளம் 10 பாடல்கள்

#### அலகு-II

பெரியபுராணம்-  
கம்பராமாயணம்

மெய்ப்பொருள் நாயனார் புராணம்  
-வாலி வதைப்படலம்

#### அலகு-III

சீறாப்பராணம் -  
இயேசுகாவியம் -

கரம் பொருத்து படலம்  
மலைப்பொழிவு

#### அலகு-IV

இலக்கணம்-  
மண்பாட்பகுதி

யாப்பு இலக்கணம்

#### அலகு-V

இலக்கிய வரலாறு  
காப்பியங்கள்  
ஐஞ்சிறுகாப்பியங்கள்  
புராணங்கள், இதிகாசங்கள்

## EMPLOYABILITY



Course Code	Course Title	L	T	P	C
19111AEC32	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 – 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

**References:-**

Nine Short Stories	-Steuart H.King Blackie Books
One-Act plays of Today	-T.Prabhakar Emerald Publishers

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC33	Literature in Augustan Period	4	0	0	4

**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:**

- Understand British Literature in Augustan period
- Recognise, interpret 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
19111AEC34	Literature in Romantic Period	4	0	0	4

**Aim:**

- To acquaint with an explosive reaction against the preceding Augustan Literature

**Objective:**

- To let the students 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 enable the students to appreciate the literary outputs of the Romantic period

**Outcome:**

- Understand British Literature in Romantic period
- Recognise, 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
19111SEC35	Literary Forms and Prosody	4	0	0	4

**Aim**

- To acquaint with the features of literary genres and prosody.

**Objective:**

- To enable the students to learn the matter, manner and style of every literary form in English Literature
- To make the students speak and write effectively by knowing the figures of speech

**Outcome:**

- Understand 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

**References:**

A Background to the Study of English Literature - B.P.Prasad Macmillan

Objective English Literature

-Dr.Sathish Kumar

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111AEC36	Shakespeare	4	0	0	4

**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

**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
19111RMC37	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

**Outcome:**

- Ability to carry out independent literature survey corresponding to the specific publication type and assess basic literary research tools.

**Prerequisites:**

- Basic computer skills for working in window-environment & Conceptual knowledge on basic matrices

**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

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19120SEC03A	Skill Based Elective-III Packages Lab-III	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
- Create a slide show presentation for a shop advertisement to be open shortly
5. 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)
  6. Create a slide show presentation for a tourists places
  7. Create a slide for calendar using appropriate text attributes and insert an object from a bitmap file

### EMPLOYABILITY

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC03B	Skill Based Elective-III Soft Skill-III	0	0	2	1

## **Interpersonal Relations and Social Responsibilities**

### **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.

## **ENTREPRENEURSHIP**



Course Code	Course Title	L	T	P	C
19111SEC03L	Communicative English Lab-III	0	0	2	1

**Aim:**

- To acquaint with the basic grammar and develop language skills

**Objective:**

- To change a sentence from active to passive and vice versa
- To make sentences
- To write a letter
- To improve vocabulary
- To enhance speaking skills
- To enrich writing skills

**Outcome:**

- Understand grammar
- Develop speaking and writing skills

**UNIT –I**

Active and Passive

**UNIT –II**

Developing the hints

**UNIT –III**

Letter writing

**UNIT –IV**

Speaking-benefits-features of a good speaker-Tip for improving speech-types

**UNIT –V**

Writing-benefits-types-tips for improving writing

**Lab Note-1.** Anagrams, Word Traps, Stinging Words, letter writing from Globarena Software, Self-introduction, 2. Picture writing note book

**Viva-**Self introduction, Picture talk

**Exam components-**Theory -50+MCQ online exam -20+Viva-15+Lab note-10=100

**References:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication-Rajendra Pal &J.SKorlahalli Sultan Chand & Sons

**EMPLOYABILITY/ SKILL DEVELOPMENT**

## SEMESTER – IV

Course Code	Course Title	L	T	P	C	Marks
19110AEC41	Tamil-IV	4	0	0	2	100

### SEMESTER – IV

Semester	Subject Code	Title of the Course
IV	17110AEC41	செய்புள்- சங்க இலக்கியம்,இலக்கணம்,இலக்கிய வரலாறு- மனப்பாடப் பகுதி

#### அலகு-I

எட்டுத்தொகை நற்றிணை - 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 - முழு வதும்  
திருக்குறள்- ஜந்து அதிகாரம்-  
அறம் 2,பொருள் 2,இன்பம் -1 வாணிற்றுப்பு,அழககாராமை,இறைமட்சி,கடாறப்பு,காதற்சிறப்புரைத்தல்

#### அலகு-IV

இலக்கணம் அணி

மனப்பாடப் பகுதி

#### அலகு-V

இலக்கிய வரலாறு  
எட்டுத்தொகை  
பத்துப்பாட்டு  
அறுஇலக்கியங்கள்

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC41	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 & Sons	-Rajendra Pal &J.S Korlahalli Sultan Chand
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
English for writers and translators	-Robin Macpherson
English Work Book-I&II	-Jewelcy Jawahar

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111AEC42	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

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC43	Language and Linguistics	4	1	0	5

**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 let the students transcribe the words

**Outcome:**

- Understand Linguistic aspects through Phonetics.

**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

**References:-**

The Study of Language - George Yule

English Phonetics and Phonology -Peter Roach

A text book of Phonetics for Indian Students -T.B. Balasubramaniyan

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111AEC44	Literature in Victorian Period	4	0	0	4

**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
- Recognise, 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
19111AEC45	Literary Criticism	5	0	0	5

**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

**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

**References:-**

Principles of Literary Criticism -S.Ravindranathan.

**ENTREPRENEURSHIP**

Course Code	Course Title	L	T	P	C
19111AEC46	Indian and European Classics in translation	4	0	0	4

**Aim:**

- To facilitate students to understand the art of translation

**Objective:**

- To familiarize students 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.

**UNIT- I**

The Odyssey -Homer

**UNIT -II**

Faust -Gothe

**UNIT- III**

Shakuntala -Kalidasa

**UNIT- IV**

Thirukkural -Thiruvalluvar

**UNIT -V**

The Ramayana -Rajagopalachari

**SKILL DEVELOPMENT**



<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04A	Skill based Elective -IV Packages Lab-IV	0	0	2	1

### **MS-ACCESS**

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the universality exams
3. Create a database for sorting the date of joining by the employee in the organization.
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 employee database

### **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19160SEC04B	Skill based Elective -IV Soft Skill-IV	0	0	2	1

## **Etiquette and Interviewing Skills**

### **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.

## **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC04L	Communicative English Lab-IV	0	0	1	1

**Aim:**

- To develop communicative skills

**Objective:**

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To develop presentation skill
- To enrich vocabulary

**Outcome:**

- Understand grammar
- Develop language and presentation skills

**UNIT –I**

Direct and Indirect

**UNIT –II**

Comprehension

**UNIT –III**

Conversation

**UNIT –IV**

Descriptive Writing

**UNIT –V**

Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception

**Lab Note**-Confusing Words, Word families, Non-English words, Presentation skills, Oral presentation, Conversation from Globarena software

**Viva**-Presenting a topic

**Exam components**-Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**References:-**

- English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons  
 Soft skills -D.Jayacandran D.J Publishers

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

**Aim:**

- To know the concept of an ecosystem and its type

**Objective:**

- To be aware of the natural resources
- To acquaint the concept of an ecosystem and its type
- To understand biodiversity and its conservation
- To learn about environmental pollution
- To familiarize with the social issues and the environment

**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.

**Text Book:**

“Environmental Studies”, K.Kumarasamy, A.Alagappa Moses, M.Vasanthy.

**EMPLOYABILITY/ SKILL DEVELOPMENT**

## SEMESTER - V

Course Code	Course Title	L	T	P	C
19111AEC51	Literature in Modern Period-I	5	0	0	4

**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
- Recognise, interpret and 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
19111AEC52	American Literature	5	0	0	5

**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:**

- Understand American Literature
- Recognise, interpret and explain 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

**Self study topics:**

Catcher in the Rye -J.D Salinger

Angels in America -Tony Kushner

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC53	English Language Teaching	4	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

**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

**References:-**

Methods of Teaching English -Dr.P.S.S Sastry Book I, II (Madhava Publishers)  
Modern Teaching of English -Dr. M.S Sachdeva (Bharath Book Centre)  
Teaching of English -P.P Khatri

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111SEC54	Translation	4	1	0	5

**Aim:**

- To acquaint the students 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:**

- Understand the art of 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

**References:**

Towards Translation

- Dr. R Shanthi

Translation

-Sreedevi K.Nair

Translation

-Dr.Raman

Techniques of Translation

-Dr.A.Nihamathullah

**SKILL DEVELOPMENT**



Course Code	Course Title	L	T	P	C
19111DSC55A	Discipline Specific Elective – IA Single Author Study- Tagore	5	0	0	4

**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

**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**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111DSC55B	Discipline Specific Elective – IB Single Author Study-Oliver Goldsmith	5	0	0	4

**Aim:**

- To acquaint the students with selected literary texts of Goldsmith belonging to the genres of poetry, prose and drama.

**Objective**

- To familiarize and know in detail Goldsmith’s poetry, prose fiction and drama
- To appreciate Goldsmith’s works

**Outcome:**

- Understand Goldsmith’s writings

**UNIT- I**

The Deserted Village

**UNIT- II**

The Hermit

The Gift

**UNIT- III**

The Citizen of the World

**UNIT- IV**

The Vicar of Wakefield

**UNIT- V**

She Stoops to Conquer

**EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC05A	Skill based Elective -V Packages Lab-V	0	0	2	1

### **PHOTOSHOP**

1. Design a Visiting card.
2. Design a Identity card.
3. Design a letter pad with LOGO.
4. Create an advertisement for News paper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

### **EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC05B	Skill based Elective -V Soft Skill-V	0	0	2	1

## **Leadership Skills and Body Language**

### **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

### **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC05L	Communicative English Lab-V	0	0	2	1

**Aim:**

- To develop communicative skills

**Objective:**

- To understand the degrees of comparison
- To build up a thought
- To write resume
- To construct report, agenda and minutes
- To prepare for an interview

**Outcome:**

- Develop communicative skills
- To get a job

**UNIT -I**

Degrees of comparison

**UNIT -II**

Proverb expansion

**UNIT -III**

Resume writing

**UNIT -IV**

Interview

**UNIT -V**

Corporate skills-body language-etiquette-good manners-interpersonal skills

**Lab Note-**Report writing, Resume writing, Interview from Globarena software, Writing agenda, Writing minutes

**Viva-**Mock Interview

**Exam components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**References:-**

- English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication-Rajendra Pal &J.SKorlahalli Sultan Chand & Sons  
 Soft skills -D.Jayacandran D.J Publishers

**EMPLOYABILITY/ SKILL DEVELOPMENT**

## SEMESTER - VI

Course Code	Course Title	L	T	P	C
19111AEC61	Literature in Modern Period-II	5	0	0	4

### Aim:

- To help the students have a glimpse into the modern literature

### Objective :

- To familiarize the students with the twentieth century literary trends reflected in the form and content of poetry, fiction and drama

### Outcome:

- Understand British Literature in Modern period
- Recognise, interpret and explain 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

### Self study topics:

The Grass is Singing -Doris Lessing

The Lady is not Burning -Christopher Fry

### EMPLOYABILITY

Course Code	Course Title	L	T	P	C
19111AEC62	Indian Writing in English	5	0	0	5

**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:**

- Understand Indian Writing in English
- Recognise, interpret 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  
-Ismat Chughtat

**UNIT IV**

Nagamandala -Girish Karnard

**UNIT V**

Untouchable -Mulik Raj Anand

**Self study topics:**

Inside the Haveli -Rama Mehta  
Tara -Mahesh Dattani

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19111AEC63	Commonwealth Literature	5	0	0	5

**Aim:**

- To help the students 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
- Recognise, interpret and explain the connections between their own experiences and the world using the texts

**UNIT – I**

The Dying Eagle -E.J. Pratt

Australia -A.D. Hope

**UNIT-II**

Relationships -Jayant Mahapatra

Fire at Murdering Hut -Judith Wright

**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
19111DSC64A	Discipline Specific Elective –II A Study of a Genre-Poetry	5	0	0	4

**Aim:**

- To give a profound study of poetry as a form of literature

**Objective:**

- To study in depth the different forms of poetry such as Ode, Lyric, Elegy, Sonnet and Ballad
- To understand the structure and features of different forms of poetry

**Outcome:**

- Understand the different forms of poetry

**UNIT I**

The Ode

To Evening -William Collins.

To Autumn -John Keats.

**UNIT II**

The Lyric

Leda and the Swan -W.B.Yeats

The Hound of Heaven - Francis Thompson.

**UNIT III**

The Elegy

In Memory of W.B.Yeats -W.H.Auden

Elegy Written In A Country Churchyard -Thomas Gray

**UNIT IV**

The Sonnet

The World is too much for us. -William Wordsworth.

On his Blindness - John Milton

**UNIT V**

The Ballad

The Rime of Ancient Mariner - Samuel Taylor Coleridge

The Lady of Shalott - Alfred Lord Tennyson

**EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111DSC64B	Discipline Specific Elective –II B Study of a Genre-Novel	5	0	0	4

**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:**

- Understand the different forms 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**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC06A	Skill based Elective -VI Packages Lab-VI	0	0	2	1

### **FLASH**

1. Drawing and painting original art in flash.
2. Creating simple objects using flash.
3. Creating a frame-by-frame animation techniques.
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 animations techniques movie clip and graphic symbols.

### **EMPLOYABILITY**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC06B	Skill based Elective -VI Soft Skill -VI	0	0	2	1

### **Life Skills and other Skills**

#### **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.

#### **EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19111SEC06L	Communicative English Lab-VI	0	0	2	1

**Aim:**

- To develop communicative skills

**Objective:**

- To write simple, compound and complex sentences
- To extract the main ideas from a text
- To shorten a text
- To enhance writing skills
- To learn to manage time and stress
- To widen creative thinking
- To enrich the skill of working in a group

**Outcome:**

- Develop communicative skills
- To be a good team worker

**UNIT –I**

Simple, Compound and Complex

**UNIT –II**

Note making

**UNIT –III**

Precise writing

**UNIT –IV**

Developing a story

**UNIT –V**

Essay writing

**Lab Note**-Creative thinking, Time management, Stress management, Assertiveness, Group discussion from Globarena Software

**Viva**-Group discussion

**Exam components**-Theory -50+MCQonline exam-20+Viva-15+Lab note-15=100

**References:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication-Rajendra Pal &J.SKorlahalli Sultan Chand & Sons

**EMPLOYABILITY/ SKILL DEVELOPMENT**



**M.A ENGLISH LITERATURE -CURRICULUM – REGULATION 2019**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19211AEC11	History of English Language and Structure	6	0	0	4
19211AEC12	Shakespeare	5	0	0	4
19211AEC13	British Literature	5	0	0	4
19211AEC14	Indian Writing in English	5	0	0	4
19211DSC15_	Discipline Specific Elective – I	5	0	0	4
19211RLC16	Research Led seminar	-	-	-	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>0</b>	<b>21</b>
<b>SEMESTER II</b>					
19211AEC21	Women’s writing in English	5	0	0	4
19211AEC22	Post Colonial literature	6	0	0	4
19211AEC23	Comparative Literature & World Classics in Translation	6	0	0	4
19211DSC24_	Discipline Specific Elective – II	5	0	0	4
19211RMC25	Research Methodology	3	0	0	3
19211BRC26	Participation in Bounded Research	-	-	-	2
	<b>Total</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>21</b>
<b>SEMESTER III</b>					
19211SEC31	Critical Approaches to English Literature	5	0	0	5
19211AEC32	American Literature	5	0	0	5
19211AEC33	Literary Criticism	6	0	0	5
19211DSC34_	Discipline Specific Elective – III	5	0	0	4
192__OEC	Open Elective	4	0	0	2
19211SRC36	Societal Project (Scaffold Research)	-	-	-	2
	<b>Total</b>	<b>25</b>	<b>0</b>	<b>0</b>	<b>23</b>
<b>SEMESTER IV</b>					
19211SEC41	Translation	5	1	0	5
19211SEC42	English Language Teaching	4	1	1	5

19211AEC43	English Literature for Competitive Examination	6	0	0	5
19211DSC44	Discipline Specific Elective – IV	5	0	0	4
19211PRW45	Project Work	0	0	0	6
19211PEE	Translation	0	0	0	2
	<b>Total</b>	<b>20</b>	<b>2</b>	<b>1</b>	<b>27</b>
	<b>Total Credits for the Programme</b>				<b>92</b>

### Discipline Specific Electives

Semester	Discipline Specific Elective Courses
I	a)19211DSC15A- Romantic Movement b)19211DSC15B- Literary Movement
II	a)19211DSC24A- Canadian Literature b)19211DSC24B- Diaspora literature
III	a)19211DSC34A- African Literature b)19211DSC34B- Popular Literature
IV	a)19211DSC44A- Australian Literature b)19211DSC44B- Indian Fiction in Translation



**M.A ENGLISH LITERATURE SYLLABUS – REGULATION 2019**  
SEMESTER - I

Course Code	Course Title	L	T	P	C
19211AEC11	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:**

- Understand 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.

**UNIT – I**

The origin of language  
The descent of the English language  
Laws of language

**UNIT – II**

The Old English period  
The Middle English period  
The Renaissance and after

**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

**References:**

An Outline History of English Language -F.T. Wood  
The English Language -C.L. Wren

**SKILL DEVELOPMENT**



Course Code	Course Title	L	T	P	C
19211AEC12	Shakespeare	5	0	0	4

**Aim:**

To acquaint with Shakespeare who is not of an age but of all times

**Objective:**

To understand the genius and the craftsmanship of Shakespeare.

**Outcome:**

Understand the craftsmanship of Shakespeare.

**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
19211AEC13	British Literature	5	0	0	4

**Aim:**

2. To study the different genres of British Literature

**Objective:**

3. To facilitate the study of the epic, Elizabethan prose, drama and fiction in the later period

**Outcome:**

4. Understand the different genres of British Literature

**UNIT-I**

Paradise Lost -John Milton  
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
19211AEC14	Indian Writing in English	5	0	0	4

**Aim:**

- To make the students 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.

**Outcome:**

- Understand the genesis of Indian English literature and its output in different forms.

**UNIT I**

Origin and growth of Indian Literature – Poetry, Prose and Drama

**UNIT II**

Rumination -Daruwallah

Poet, Lover and Bird – Watcher -Ezekiel

A Hot Noon in Malabar -Kamala Das

**UNIT III**

The Autobiography of an Unknown Indian -Nirad Chaudry

My Experiments with Truth -M.K.Gandhi

**UNIT IV**

The Serpent and the Rope -Raja Rao

That Long Silence -Shashi Deshpande

**UNIT V**

Hayavadhana - Girish Karnard

Silence, The Court is in Session - Vijay Tendulkar

**References:**

Objective English Literature - Dr. Sathish Kumar.

**Self-study topics:**

From Heaven Lake -Vikram Seth

The Doldrummers -Asif Currimbhoy

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19211DSC15A	Discipline Specific Elective – I A 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:**

- Understand the features and background of Romanticism
- Appreciate the works of writers influenced by the Romantic Movement

**UNIT-I**

Romanticism- Characteristics, background of the movement

**UNIT-II**

Songs of Innocence – The Lamb - William Blake  
 Ode to Intimation on Immortality - Wordsworth  
 Ode to Dejection - S.T.Coleridge.

**UNIT-III**

To a Skylark -Shelley  
 La Belle Dame Sans Merci - Keats  
 The Prisoner of Chillon - Byron.

**UNIT-IV**

The Lotus - Toru Dutt  
 The Snake Charmer - Sarojini Naidu  
 Transformation - Sri.Aurobindo

**UNIT-V**

The Philosophy of Composition - Poe  
 A Red, Red Rose -Robert Burns  
 The Rhodora -Ralph Waldo Emerson

**References:**

Major Movements in English Literature - S.C.Mundra

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211DSC15B	Discipline Specific Elective – I B Literary Movement	5	0	0	4

**Aim:**

- To acquaint with many literary movements

**Objective:**

- To learn the features of the various literary movements
- To understand the background and the writers of all the literary movements

**Outcome:**

- Understand the background and the writers of all the literary movements

**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

**References:**

Major Movements in English Literature - S.C.Mundra

**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 trend in favour of the rights 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:

- Learn the perspectives of women writers

### 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
19211AEC22	Post Colonial Literature	6	0	0	4

**Aim:**

- To let the students 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 understand 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

**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**

Ice-Candy Man -Bapsi Sidhwa

The Shadow Lines -Amitav Ghosh

**UNIT – V**

The English Patient -Michael Ondaatje

Heat and Dust -Ruth Jabwala

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211AEC23	Comparative Literature & World Classics in Translation	6	0	0	4

**Aim:**

- To familiarize students 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

**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

**References:**

Introduction to the study of Comparative Literature-TEESI

**Skill Development**



Course Code	Course Title	L	T	P	C
19211DSC24A	Discipline Specific Elective– II A Canadian Literature	5	0	0	4

**Aim:**

- To acquaint the students with the Canadian literature

**Objective:**

- To let the students know how an indomitable urge for seeking separate identity find expression in the different genres of literature.
- To trace the origin and growth of Canadian literature
- To enable learners to understand Canadian literature, their landscape, tradition, milieu, spirit, socio-cultural ethos, national identity etc.

**Outcome:**

- Learn the origin and growth of Canadian literature
- Understand Canadian literature, their landscape, tradition, milieu, spirit, socio-cultural ethos, national identity etc.

**UNIT – I**

Origin and growth of Canadian Literature - Poetry, Prose and Drama

**UNIT – II**

The Canadian Authors Meet -F.R.Scott

Journey to the Interior -Margaret Atwood.

The Lonely Land -A.J Smith

**UNIT – III**

The Loons -Margaret Lawrence.

Lamp at Noon -Sinclair Ross

**UNIT – IV**

The Sin Eater -Margaret Atwood.

The Old Woman -Joyce Marshall

**UNIT – V**

Surfacing Margaret Atwood.

Ecstasy of Rita Joe -George Ryga

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211DSC24B	Discipline Specific Elective II –B Diaspora Literature	5	0	0	4

**Aim:**

- To acquaint the students 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.

**UNIT – I**

History of Diaspora Literature, Theories

**UNIT – II**

A House of Mr. Biswas -V.S Naipaul  
The Bankster -Ravi Subramaniam

**UNIT – III**

Jasmine -Bharathi Mukerjee  
The Mango Coloured Fish -Kaveri Nambesan

**UNIT – IV**

The Tree Man -Patrick White  
The White Tiger -Aravind Adiga

**UNIT – V**

Shame -Salman Rushdie  
Can Love Happen Twice -Ravinder Singh

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211RMC25	Research Methodology	3	0	0	3

**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 and 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

**REFERENCE:**

- M LA Hand Book VII Ed -Joseph Gibaldi
- Thesis and Assignment writing- Anderson et al
- Research Methodology-Methods and techniques- C.R Kothari

**EMPLOYABILITY/ SKILL DEVELOPMENT**

### SEMESTER III

Course Code	Course Title	L	T	P	C
19211SEC31	Critical Approaches to English Literature	5	0	0	5

**Aim:**

- To acquaint the students with various approaches to literature.

**Objective:**

- To make the students realize that an impassioned scientific approach even to aesthetic delight has its own validity.
- To analyse a text using various approaches

**Outcome:**

- Analyse a text using various approaches to English Literature

**UNIT-I**

Archetypal Approach

**UNIT-II**

Moral Approach

**UNIT-III**

Formalistic Approach

**UNIT-IV**

Psychological Approach

**UNIT-V**

Sociological Approach

**References:**

Five Approaches to Literature -F.R.Scott

A Handbook of Critical Approaches to Literature -Wilfred L.Guerin

**Term paper:**

Analyse a text using various approaches to English Literature

### ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
19211AEC32	American Literature	5	0	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 provide a historical background to American history and literature
- To understand the major themes and concerns reflected in American literature

**Outcome:**

- Understand the major themes and concerns reflected in American literature

**UNIT I**

Origin and growth of American Literature - Prose,Poetry and Drama

**UNIT II**

Daddy -Sylvia Plath  
 After Apple Picking -Robert Frost  
 Helen -Edger Allen Poe

**UNIT III**

The American Scholar -Emerson  
 Walden-The Battle of Ants -Thoreau

**UNIT IV**

The Scarlet Letter -Hawthorne  
 Farewell to Arms -Hemingway

**UNIT V**

The Hairy Ape -O’ Neil  
 All My sons -Arthur Miller

**References-**

History of American Literature - Dr.Varshiney  
 Objective English Literature - Dr.Sathish Kumar.

**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
19211AEC33	Literary Criticism	6	0	0	5

**Aim:**

- To let the students recapitulate the origin and development of criticism from the period of Aristotle to modern age.

**Objective:**

- To instill in the minds of students 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:**

- Analyse a text using various criticism

**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

**References:**

Principles and History of Literary Criticism – S.C.Mundra, S.C.Agarwal.

**ENTREPRENEURSHIP**

Course Code	Course Title	L	T	P	C
19211DSC34A	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 let the students know how an indomitable urge for seeking separate identity finds expression in the different genres of literature.
- To enable learners to understand African literature, their landscape, tradition, milieu, spirit, socio cultural ethos, national identity etc.

**Outcome:**

- Understand the origin and growth of African literature.
- Enable learners 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 wa Thiongo

**UNIT – V**

The Road -Wole Soyinka  
Devil on the Cross -Ngugi wa Thiongo

**References-**

Objective English Literature -Dr.Sathish Kumar

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211DSC34B	Discipline Specific Elective - III B Popular Literature	5	0	0	4

**Aim:**

- To acquaint the students with the Popular literature

**Objective:**

- To know the writings intended for the mass and those that find favour with large audience.
- To understand the history of popular literature
- To familiarize with the genres of popular literature

**Outcome:**

- Familiarize with the genres of popular literature

**UNIT – I**

Origin and growth of popular Literature-genres

**UNIT – II**

War and Peace -Leo Tolstoy

2States -Chetan Bhagat

**UNIT – III**

The Life of Pie -Yann Mortal

Invisible Man -Ralph Waldo Ellison

**UNIT – IV**

The Murder of Roger Ackroyd -Agatha Christie

The Great Gatsby -F.Scott Fitzgerald

**UNIT – V**

Through the Looking Glass -Lewis Carroll

To Kill a Mocking Bird -Harper Lee

**EMPLOYABILITY/ SKILL DEVELOPMENT**

|



## SEMESTER – IV

Course Code	Course Title	L	T	P	C
19211SEC41	Translation	5	1	0	5

### Aim:

- To initiate the students into the mechanics of translations

### Objective:

- To let the students 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:

- Develop the translation skill

### 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

### References-

Towards Translation

-Dr. R Shanthi

Translation

-Sreedevi K.Nair

Translation

-Dr.Raman

Techniques of Translation

-Dr.A.Nihamathullah

### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19211SEC42	English Language Teaching	4	1	1	5

**Aim:**

- To let the students 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 students to have a good stead for the career of English teacher

**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

Methods

**UNIT-IV**

Techniques for language teaching

Audio – Visual Teaching

**UNIT-V**

Micro Teaching

Macro Teaching

Case study

**References-**

Methods of Teaching English -Dr. P.S.S Sastry Book I, II (Madhava Publishers)

Modern Teaching of English - Dr. M.S Sachdeva (Bharath Book Centre)

Teaching of English - P.P.Khatri

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211AEC43	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 make the students resuscitate what has been learnt in every branch of English Language and Literature and compete with others for a career.
- To instill in students the confidence and skills to face the challenge of a competitive exam

**Outcome:**

- To take up a competitive exam.

**UNIT-I**

British Literature

**UNIT-II**

American Literature

**UNIT-III**

Indian Writing in English

**UNIT-IV**

Literary Forms

**UNIT-V**

English Language Teaching

**References-**

Objective English Literature - Dr.Sathish Kumar.

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19211DSC44A	Discipline Specific Elective - IVA Australian Literature	5	0	0	4

**Aim:**

- To acquaint the students with the Australian literature

**Objective:**

- To trace the origin and growth of Australian literature
- To appreciate the works of different writers
- To enable learners to understand Australian literature, their landscape, tradition, milieu, spirit, socio-cultural ethos, national identity etc.

**Outcome:**

- Learn the origin and growth of Australian literature
- Understand Australian literature, their landscape, tradition, milieu, spirit, socio-cultural ethos, national identity etc.

**UNIT – I**

Origin and growth of Australian Literature-Poetry, Prose and Drama

**UNIT – II**

Legend -Judith Wright.

Mister Man -Kevin Gilbert

The Australian Dream -David Campbell

**UNIT – III**

The Drover's Wife -Henry Lawson

The Seizure of the Cyprus -Marcus Clarke

**UNIT – IV**

Tirra Lirra by the River -Jessica Anderson

Voss -Patrick White

**UNIT – V**

Remembering Babylon -Malouf

The Piano Teacher -Elfriedie Jelinek

**References-**

Objective English Literature -Dr.Sathish Kumar

**EMPLOYABILITY/ SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19211DSC44B	Discipline Specific Elective - IV B Indian Fiction in Translation	5	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:**

- Understand the fiction in other languages in India

**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-2019 REVISED COURSE STRUCTURE**

Course Code	Course Title	C	Marks
<b>Semester I</b>			
193ENC11	Research Methodology and Theory of Literature	5	100
193ENC12	Literary Theory	5	100
193ENC13-	Elective	5	100
	<b>Total</b>	<b>15</b>	<b>300</b>
<b>Semester II</b>			
193END21	Dissertation	15	100
	<b>Total</b>	<b>15</b>	<b>100</b>
<b>Total</b>		<b>30</b>	<b>400</b>



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## DEPARTMENT OF ENGLISH

### M.Phil ENGLISH LITERATURE-2019 SYLLABUS OF REVISED COURSES

#### RESEARCH METHODOLOGY AND THEORY OF LITERATURE-193ENC11

##### 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

##### Outcome:

- Can do research activity
- Interpret any text using various criticisms and theories

##### UNIT-1

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

##### Employability

## LITERARY THEORY-193ENC12

### **Aim:**

- To acquaint with the concepts and features of different literary theories

### **Objective:**

9. To sharpen the critical ability by learning the literary theories
10. 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:**

Beginning Theory-Peter Harry

### **EMPLOYABILITY**



## **-MODERN CRITICISM -193ENC13A**

### **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/ SKILL DEVELOPMENT**



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**B.Sc., MATHEMATICS(  
2019-REGULATION)**

# Department of Mathematics

<b>1.1.2</b>	<b>Colour</b>
	Employability
	Skill Development



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**DEPARTMENT OF MATHEMATICS**

**B.Sc., MATHEMATICS CURRICULUM**

**REGULATION 2019**



**B.Sc., MATHEMATICS – SYLLABUS – REGULATION 2019**

**COURSE STRUCTURE**

<b>SEMESTER – I</b>					
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19110AEC11/ 19111AEC11/ 19132AEC11/ 19135AEC11	Tamil – I / Advanced English – I / Hindi – I / French – I	4	0	0	2
19111AEC12	English – I	4	0	0	2
19112AEC13	Differential Calculus and Vector Differentiation	4	1	0	4
19112AEC14	Trigonometry, Analytical Geometry 3D and Calculus	4	0	0	4
19120AEC15	Programming in C	6	0	0	6
19120AEC16L	Programming in C Lab	0	0	3	2
191__SEC01_	Skill Based Elective – I	0	0	2	1
19111SEC01L	Communicative English Lab – I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>23</b>

<b>SEMESTER-II</b>					
<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19110AEC21/					
19111AEC21/	Tamil-II/AdvancedEnglish-II/Hindi-II/	4	0	0	2
19132AEC21/	French-II				
19135AEC21					
19111AEC22	English-II	4	0	0	2
19112AEC23	DifferentialEquations	4	1	0	4
19112AEC24	VectorintegrationandClassicalAlgebra	4	0	0	4
19120AEC25	WebProgramming	6	0	0	6
19120AEC26L	WebDesigningLab	0	0	3	2
19112RLC27	ResearchLEDSeminar	1	1	1	1
191__SEC02_	SkillBasedElective-II	0	0	2	1
19111SEC02L	CommunicativeEnglishLab-II	0	0	2	1
	<b>Total</b>	<b>22</b>	<b>1</b>	<b>7</b>	<b>23</b>

SEMESTER-III					
COURSECODE	COURSE TITLE	L	T	P	C
19110AEC31/					
19111AEC31/	Tamil-III/AdvancedEnglish-III/Hindi-III/	4	0	0	2
19132AEC31/	French-III				
19135AEC31					
19111AEC32	English-III	4	0	0	2
19112AEC33	NumberTheory	5	0	0	5
19112AEC34	NumericalAnalysis	4	0	0	4
19118AEC35	MathematicalStatisticsI	3	0	0	3
19118AEC36	MathematicalStatisticsII	3	0	0	3
19112RMC37	ResearchMethodology	3	0	0	3
191__SEC03_	SkillBasedElective-III	0	0	2	1
19111SEC03L	CommunicativeEnglishLab-III	0	0	2	1
	<b>Total</b>	<b>26</b>	<b>0</b>	<b>4</b>	<b>24</b>

SEMESTER-IV					
COURSECODE	COURSETITLE	L	T	P	C
19110AEC41/ 19111AEC41/ 19132AEC41/ 19135AEC41	Tamil-IV/AdvancedEnglish-IV/Hindi- IV/French- IV	4	0	0	2
19111AEC42	English-IV	4	0	0	2
19112AEC43	SequeneandSeries	4	0	0	4
19112SEC44	OperationsResearch	4	0	0	4
19112SEC45	Astronomy	4	0	0	4
19118AEC46	MathematicalStatisticsIII	3	1	0	3
19118AEC47L	MathematicalStatistics	0	0	1	3
191__SEC04_	SkillbasedElective- IV	0	0	2	1
19111SEC04L	CommunicativeEnglishLab-IV	0	0	1	1
191ENVTSTU	EnvironmentalStudies	1	0	0	1
	<b>Total</b>	<b>24</b>	<b>1</b>	<b>4</b>	<b>25</b>

SEMESTER-V					
COURSECODE	COURSETITLE	L	T	P	C
19112AEC51	ModernAlgebra	6	0	0	6
19112AEC52	RealAnalysis	6	0	0	5
19112SEC53	Statics	4	1	0	5
19112SEC54	ProgramminginC++	4	0	0	4
19112DSC55_	DisciplineSpecificElective-I	5	0	0	3
19112BRC56	ParticipationinBoundedResearch	-	-	-	2
191__SEC05_	SkillBasedElective-V	0	0	2	1
19111SEC05L	CommunicativeEnglishLab-V	0	0	2	1
	<b>Total</b>	<b>25</b>	<b>1</b>	<b>4</b>	<b>27</b>



**SEMESTER-VI**

<b>COURSECODE</b>	<b>COURSETITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112AEC61	ComplexAnalysis	5	0	0	5
19112SEC62	Dynamics	4	0	0	4
19112AEC63	DiscreteMathematics	4	0	0	4
19120SEC64L	ProgramminginC++Lab	0	0	3	2
19112DSC65_	DisciplineSpecificElective - II	5	0	0	4
191__OEC_	OpenElective	4	0	0	2
19112PRWP67	ProjectWork	-	-	-	4
191__SEC06_	SkillBasedElective -VI	0	0	2	1
19111SEC06L	CommunicativeEnglishLab-VI	0	0	2	1
19112EXACT_	Extensionactivities	-	-	-	1
19112PEE	ProgrammeExitExamination	-	-	-	2
	<b>Total</b>	<b>22</b>	<b>0</b>	<b>7</b>	<b>30</b>
<b>TotalCreditsoftheProgramme</b>					<b>152</b>

## DISCIPLINESPECIFIC ELECTIVE COURSES

Semester	Elective No.	Course Code	Course Title
V	I	19112DSC55A	a) Fuzzy Analysis
		19112DSC55B	b) Formal Languages And Automata Theory
VI	II	19112DSC65A	a) Graph Theory
		19112DSC65B	b) Mathematical Modelling

## OPEN ELECTIVE COURSE

Semester	Course Title
VI	a.19111OEC- Journalism b.19113OEC- Instrumentation c.19114OEC- Food and Adulteration d.19117OEC-Mushroom Technology e.19120OEC- Web Technology f.19122OEC-E-Commerce and its applications g.19161OEC- Indirect Taxes

## SKILLBASEDELECTIVECOURSES

SEMESTER	SKILL BASED ELECTIVE NO.	COURSECODE	COURSETITLE
I	I	19120SEC01AL 19160SEC01B	a) PackageLabI b) SoftSkillI
II	II	19120SEC02AL 19160SEC02B	a) PackageLabII b) SoftSkillII
III	III	19120SEC03AL 19160SEC03B	a) PackageLabIII b) SoftSkillIII
IV	IV	19120SEC04AL 19160SEC04B	a) PackageLabIV b) SoftSkillIV
V	V	19120SEC05AL 19160SEC05B	a) PackageLab V b) SoftSkillV
VI	VI	19120SEC06AL 19160SEC06B	a) PackageLabVI b) SoftSkillVI

## CreditDistribution

Sem	AEC	SEC	DSC	OEC	Researc h	NON CGP	Total
I	20	2	-	-	-	1	23
II	20	2	-	-	1	-	23
III	19	2	-	-	3	-	24
IV	14	10	-	-	-	1	25
V	11	11	3	-	2	-	27
VI	9	8	4	2	4	3	30
<b>TOTAL</b>	<b>93</b>	<b>35</b>	<b>7</b>	<b>2</b>	<b>10</b>	<b>5</b>	<b>152</b>



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DEGREE: B.Sc., MATHEMATICS - SYLLABUS

SEMESTER-I

மீளும் இலக்கியம் பங்களிக்கப்படும் வகையில், தஞ்சாவூர்

பாட. குறியீடு : தமிழ் முதல் பகுதி

முதலாம் பிழைப்பு

இக்கால இலக்கியம் - செவ்வாய், சிவசுந்தரம், நாகம், இலக்கிய வரலாறு

பிழைப்பு : 1. செவ்வாய்

தாயுமானவ சுவாமிசன் - சிவசுந்தரம் - சிவசுந்தரம் - 40 பிழைகள்

இராமலிங்க பிழைகள் - சிவசுந்தரம் - சிவசுந்தரம் விண்ணப்பம் - 40 பிழைகள்

சுவாமிநாத தேவிக விநாயகம் பிள்ளை - மலரும் மாணவியும் - 52 பிழைகள்

பாரதியார் - புதுமைப்பிழை - 40 பிழைகள்

பாரதிதாசன் - பாரதிதாசன் சுவாமிநாதன், சிவசுந்தரம், சிவசுந்தரம்

பிழைப்பு : 2. செவ்வாய்

நாமச்சுவாமிநாதன் - சிவசுந்தரம் - சிவசுந்தரம் வளர்ச்சி சபதம் செவ்வாய், 40 பிழைகள்

ந. சிவசுந்தரம் - சிவசுந்தரம் - சிவசுந்தரம், 42 பிழைகள்

சுவாமிநாதன் - சிவசுந்தரம், 22 பிழைகள்

சுவாமிநாதன் - சிவசுந்தரம், சிவசுந்தரம், 54 பிழைகள்

சிவசுந்தரம் - சிவசுந்தரம், சிவசுந்தரம், சிவசுந்தரம், 80 பிழைகள்

பிழைப்பு : 3. சிவசுந்தரம்

ச. சிவசுந்தரம் - சிவசுந்தரம்

பிழைப்பு : 4. நாகம்

ச. செ. பாவப்பிரமணியன், செவ்வாய் பிழைப்பு (சுவாமிநாதன் - நாகம்)

பிழைப்பு : 5. இலக்கிய வரலாறு

சிவசுந்தரம், சிவசுந்தரம், நாகம், சுவாமிநாதன், சிவசுந்தரம், சிவசுந்தரம்

CourseCode	CourseTitle	L	T	P	C
19111AEC11	AdvancedEnglish-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 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                                    |

CourseCode		L	T	P	C
19111AEC12	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

## CoreI-BASICMATHEMATICS-I

Coursecode	CourseTitle	L	T	P	C
19112AEC13	Core -I Basic Mathematics -I (DifferentialCalculusandVector Differentiation)	4	1	0	4

### DIFFERENTIALCALCULUSANDVECTORDIFFERENTIATION

#### Objectives:

This course is designed to give students a secure base in elementary 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.

#### UNITI:

Successivedifferentiation—Leibnitztheoremwithproof—Problems,partialderivative of a function.

#### UNITII:

Maxima&Minimaforfunctionsoftwovariables—Lagrangemultipliermethod.

#### UNITIII:

Curvature(Cartesian,PolarandPedalform)—evolutes.

#### UNITIV:

Asymptotes—envelopes

#### UNITV:

Differentiationofvectors—gradient—divergenceandcurlvectors.

#### Reference

1. Differentialcalculus—T.K.M.Pillai
2. Vectorcalculus—T.K.M.Pillai.

#### Learning outcomes

Bythe endofthiscourse,youshould:

- ✓ beabletomanipulate,andsolveproblemsusing,successivedifferentiation&vector operators;
- ✓ beabletocalculateMaxima&MinimaforfunctionsoftwovariablesandLagrange multiplier method
- ✓ beabletosolvecurvature,evolutes,asymptotesandenvelopesinsimplecases
- ✓ beabletocalculategradient,divergenceandcurlvectorsin  $R^3$

## CoreII- BASICMATHEMATICS-II

Coursecode	CourseTitle	L	T	P	C
19112AEC14	Core-II BasicMathematics -II (Trigonometry,AnalyticalGeometry3D and Calculus)	4	0	0	4

### Objectives:

Thiscourseisdesignedheretogetsufficientideasaboutintegralcalculus,trigonometryand analytical geometry to tackle the mathematics needed in other sciences.

### UNITI:

Expansionsof $\cos n\theta$ , $\sin n\theta$ , $\cos^n\theta$ , $\sin^n\theta$ (forpositive integralvaluesofn) —seriesfor  $\cos \theta$ ,  $\sin \theta$ ,  $\tan \theta$ .

### UNITII:

Hyperbolic functions—Principalandgeneralvaluesoflogarithmsofcomplexnumbers. Separation of real and imaginary parts — factorization.

### UNITIII:

Summationoftrigonometricseries — methodofdifference - sumofseriesofangles in A.P,  $C+$  is form, Gregory's series.

### UNITIV:

AnalyticalGeometry(3-D)  
Spheres(SimplePropertiesonly)generalseconddegreeequationstocone cylinder.

### UNIT V:

Integralcalculus.  
EvaluationofdoubleandTripleintegral—Betaandgammaintegrals.

### References

1. Trigonometry—T.K.M.Pillai
2. AnalyticalGeometry(3D) AndIntegralCalculus—T.K.M.Pillai

### Learning outcomes

Bythe endofthiscourse,youshould:

- ✓ beabletomanipulatetheexpansionsofbasictrigonometricfunctions
- ✓ beabletocalculatesummationoftrigonometricseriesandGregory'sseries
- ✓ understand the concept ofanalyticalgeometryand be able to use properties ofspheres, cone and cylinder in real cases.
- ✓ beabletomanipulate,andsolveproblemsusing,integralcalculus



Coursecode	CourseTitle	L	T	P	C
19120AEC15	Allied- I-Paper-IProgrammingInC	6	0	0	6

**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 — 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 — Multidimensional arrays — passing array to functions — Arrays and strings String functions — String Manipulations.

**UNIT IV**

**Pointers**

Pointers Declarations — Operations on pointers — pointer 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:**

“Programming in C” — E. Balagurusamy — Tata McGraw Hill Publications

**Reference:**

1. “Programming with C” — Byron S. Gottfried — Schauni’s outline series — Tata McGraw Hill 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-IPractical-IPROGRAMMINGINCLAB

Coursecode	CourseTitle	L	T	P	C
19120AEC16L	Allied-I -Paper-IProgramminginC 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 read an integer N and determine whether N is prime or not.
4. Write a C program to find factorials, generating Fibonacci 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
- Acknowledge of writing C program
- Design/development of solutions

## PackageLab-1

### MS-WORD

CourseCode	CourseTitle	L	T	P	C
19120SEC01AL	PackagesLab-I	0	0	2	1

1. Prepare a bio-data with photos 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 marks sheet using tables. And find out the total marks.
8. Prepare a business letter for more than one company using mail merge.

CourseCode	CourseTitle	L	T	P	C
19160SEC01B	SOFTSKILLI	0	0	2	1

## Part-IEffective Communication

**UNITI**                      **EffectivecommunicationI**

**OralCommunication:** Listening skills-Speaking skills(whattosayandhowtosayit) –Gender neutral Language-Conflict, criticism, anger- Telephone skills.

**UNITII**                      **EffectivecommunicationII**

**WrittenCommunication:** Mechanicsofwriting, letters,notes,andreports-Resume preparation Faxes- Web sites- Email and Memos.

**NonverbalCommunication:** Behavior,BodylanguageandAttitude.

courseCode	CourseTitle	L	T	P	C
19111SEC01L	CommunicativeEnglish-I	0	0	1	1

**Aim:**

- Toacquaintwiththebasicgrammar

**Objective:**

- ToknowEnglishgrammarandalltheconcomitantlinguisticitems
- Tobe awareofbasic concepts relatedtothestudyofcommunication
- Tounderstand thetypesofsentencesandits patterns

**Outcome:**

- Understandgrammar

**UNIT –I**

NounPro  
nounAdje  
ctive

**UNIT- II**

VerbAdv  
erb

**UNIT-III**

ConjunctionPr  
epositionInterj  
ection

**UNIT- IV**

KindsofSentences

**UNIT –V**

Patternsofsentences

**References:-**

APracticalEnglishGrammar  
EnglishGrammar

-A.JThomsonandA.V.Martinet  
-WrenandMartin

## INDIAN CONSTITUTION

CourseCode	CourseTitle	L	T	P	C
191INDCONS	IndianConstitution	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
- 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 – works 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 – 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 – elections system and parliamentary democracy in India

State council of ministers – chief minister – elections system in India – main features – selection 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. Subashc, Our parliament, National book trust, New Delhi 1989

## **Learning Outcomes:**

1. democratic values and citizenship training are regained
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



## SEMESTER- II

மேல். இயற்கணிதம் பக்கவாக்கமுடைய வல்லம், தஞ்சாவூர்

பல. குறியீட்டு : தயிற் இலக்கியம் பருவம்

முதலாம் பிழைப்பு

கேள்விகள் , பத்திர இலக்கியம், சிறு இலக்கியம் , இலக்கிய வரலாறு

பிழைப்பு : 1 . கேள்விகள் :

1. சிறுமுனைப்பிற் றே வாரம் - வேளாறு பருவம்
2. சிறுமுனைப்பிற் றே வாரம் - தனிச் சூழற் றே வாரம்
3. வந்தற் றே வாரம் - சிறுமுனைப்பிற் றே வாரம்
4. மலர்ச்சி வாரம் - சிறுமுனைப்பிற் றே வாரம்

பிழைப்பு : 2 . கேள்விகள் :

5. சுவை வாரம் - பெருமை சிறுமுனைப்பிற் றே வாரம்
6. நயவாரம் சிறுமுனைப்பிற் றே வாரம் - இலக்கியம் பத்திர - வாரம் சிறுமுனைப்பிற் றே வாரம்
7. பிழைப்பு - நயவாரம் சிறுமுனைப்பிற் றே வாரம் - சிறுமுனைப்பிற் றே வாரம்
8. சிறுமுனைப்பிற் றே வாரம் - சிறுமுனைப்பிற் றே வாரம்

பிழைப்பு : 3 . கேள்விகள் :

- 9 . சிறுமுனைப்பிற் றே வாரம் - சிறுமுனைப்பிற் றே வாரம்
- 10 - சுவை வாரம் - மலர்ச்சி வாரம் - மலர்ச்சி வாரம் - தயிற் வாரம் - பருவம்
- 11 . சிறுமுனைப்பிற் றே வாரம் - சுவை வாரம் - சுவை வாரம் - சுவை வாரம் - சுவை வாரம்
- 12 . சுவை வாரம் - சுவை வாரம் - சுவை வாரம்

பிழைப்பு : 4 . பருவம்

- 13 . சுவை வாரம் - மலர்ச்சி வாரம் - மலர்ச்சி வாரம்

பிழைப்பு : 5 . இலக்கிய வரலாறு

- 14 . மலர்ச்சி வாரம் - சுவை வாரம் , ( மலர்ச்சி - மலர்ச்சி - மலர்ச்சி )

CourseCode	CourseTitle	L	T	P	C
19111AEC21	AdvancedEnglish-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 Workbook-I&II	-Jewelcy Jawahar

CourseCode	CourseTitle	L	T	P	C
19111AEC22	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	My - Chief Seattle
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

-Gowri Sivaraman Emerald Publishers

**Core—III-BASICMATHEMATICS-III**

**DIFFERENTIAL EQUATIONS**

Coursecode	Coursecode	CourseTitle	L	T	P	C
	19112AEC23	CoreIIIBasicMathematics -III <b>DifferentialEquations</b>	4	1	0	4

**Objectives:**

This course provides an introduction to a variety of techniques that are used throughout applied mathematics. It discusses how to translate physical problems into mathematics and covers such topics as differential equations, Laplace transformation and Fourier series. It illustrates how these are used when solving problems.

**UNIT I:**

Ordinary differential equations—Second order differential equation with constant coefficients —  $x \sin x$ ,  $x \cos x$ ,  $x^2 \sin x$ ,  $x^2 \cos x$  types only, variable coefficients.

**UNIT II:**

Variations of parameter — total differential equations. Exact differential equation  $M dx + N dy$

**UNIT III:**

Partial differential equations. Formation of equation — General, particular and complete integrals of PDE — Lagrange's method for solving  $P_p + Q_q = R$  the 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 — Vol—III— T.K.M.Pillai.

**Learning outcomes**

By the end of this course, you should:

- ✓ understand the theory of, and be able to solve (in simple cases), ordinary differential equations and partial differential equations, and standard types of linear equations;
- ✓ understand the theory of Fourier and Laplace transforms and apply it to the solution of ordinary and partial differential equations.

**Core IV - BASIC MATHEMATICS -IV**  
**VECTOR INTEGRATION & CLASSICAL ALGEBRA**

Coursecode	CourseTitle	L	T	P	C
19112AEC24	Core-IV Basic Mathematics IV (Vector integration and Classical Algebra)	4	0	0	4

**Objectives:**

This course is designed to divulge sufficient ideas about vector calculus and theory of equations to tackle the mathematics needed in other areas. Fundamental theorems such as Green's Theorem, Stokes' Theorem and Gauss's Divergence Theorem will be studied in this course. It provides the foundation for many of the courses available in applied mathematics later in the PG programme.

**UNIT I:**

**Vector Calculus:**

Integration of vectors—Gauss divergence theorem, simple illustrative problems.

**UNIT II:**

Stoke's Theorem—Green's Theorem—Simple illustrative problems

**UNIT III:**

**Algebra:**

Theory of equations — relation between root and coefficients — symmetric functions of the roots in terms of the coefficients — irrational roots — transformation of equation.

**UNIT IV:**

Reciprocal equations—Descartes' rule of sign—Horner's method of finding +ve root.

**UNIT V:**

Summation related to Binomial, Exponential and Logarithmic series—Summation of recurrence series.

**Reference:**

- (i) Vector Algebra and Analysis—T.K.M.Pillai
- (ii) Vector Analysis — T.V.Lakshmi Narashima
- (iii) Algebra—T.K.M.Pillai
- (iv) Algebra—Suriyanarayanan
- (v) Algebra—V.Seetharaman

**Learning outcomes**

By the end of this course, you should:

- Understand the theory of, and be able to solve problems in Green's Theorem, Stokes' Theorem and Gauss's Divergence Theorem
- 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

## Allied-IPaper—11WEBPROGRAMMING

Coursecode	CourseTitle	L	T	P	C
19120AEC25	Allied-I-Paper-IIWebProgramming	6	0	0	6

### Objectives

- giveyou ageneralunderstanding ofhowacomputerworks
- introduceyou toassembly-levelprogramming
- Prepareyouforfuturecourses. .

### UNIT-I

Introduction toHTML- Head and body sections- Hypertextand Linkin HTMLdocuments.

### UNIT-II

Designingthebodysection- Managingimages inHTML.

### UNIT-III

OrderedandUnorderedLists–TableHandling.

### UNIT-IV

DHTMLandStyleSheet–Frames.

### UNIT-V

AWebpagedesignproject–Forms.

### REFERENCEBOOKS:

1. WorldWideWebDesignwithHTML –c.Xavier –TataMcGraw-Hill-2000.
2. Principlesofwebdesign –JoelSklar–VikasPublishingHouse 2001.

### Learning outcomes

Bytheend ofthiscourse,you shouldbeableto:

- describethefetch-executecycle ofa computer
- understandthedifferenttypesofinformationwhichmaybestoredwithinacomputer memory
- writeasimpleassemblylanguage program

## Allied-IPractical—II WEBDESIGNINGLAB

Coursecode	CourseTitle	L	T	P	C
19120AEC26L	Allied-IPractical-IIWebDesigningLab	0	0	3	2

### Objectives

1. To create a fully functional website with mvc architecture
2. To develop an online bookstore
3. To provide an understanding of the language translation peculiarities by designing a complete translator for a mini language
1. Create a Webpage for ABC INFOTECH LTD., with necessary images and marquee.
2. Create Webpages 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 Webpage for XYZ INFOTECH LTD., to display the company profile, employee details, balance sheet, receive resume, customer service using links.
5. Using frames create webpages for a travel agency
6. Create a Webpage 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 bookstore) 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.

## PackageLab-11

### MS –EXCEL

CourseCode	CourseTitle	L	T	P	C
19120SEC02AL	PackagesLab-II	0	0	2	1

1. Prepare the addressing methods in excel
2. Describe the type of function
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 preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare an Inventory Preparation
8. Prepare an Electricity Bill Preparation



Course Code	CourseTitle	L	T	P	C
19160SEC02B	SOFTSKILLII	0	0	2	1

## Part-II Self Development

### 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

CourseCode	CourseTitle	L	T	P	C
19111SEC02L	CommunicativeEnglish-II	0	0	2	1

**Aim:**

- Toacquaintwiththebasicgrammar

**Objective:**

- To learnaboutthe auxiliaryand themodels
- Tounderstandthedifferenttensesanduseitinsentences
- Toknowwheretouseandwherenottousehearticles
- Tofamiliarizewiththe participle

**Outcome:**

- Understandgrammar

**UNIT –I**

Auxiliaries

**UNIT –II**

Modals

**UNIT –III**

Tenses-Simple,Perfect

**UNIT –IV**

Tenses-Continuous,Perfect continuous

**UNIT –V**

ArticlesP

artinciple

**Reference**

A PracticalEnglishGrammar  
EnglishGrammar

-A.JThomsonandA.V.Martinet  
-WrenandMartin

தமிழ்நிலைப் பரீட்சைக் கழகம் - வல்வம், தஞ்சாவூர்

பாட குறியீடு :

தமிழ் மூன்றாம் பருவம்

இரண்டாம் ஆண்டு

செய்தல், அட்வியர்ஸ்ச் இலக்கிய வரலாறு

செய்தல்

அககு : 1

1. சிவப்பதிகாரம் - மனைபுறம் படுத்தி காணல்
2. மணிமேகலை - ஆதினாடு சென்னைக்கு காணல்
3. சீவக சந்திரமணி - விமலவாயர் இவ்வகம்

அககு : 2

4. பெரியபுராணம் - இளையவர் குடியான நயலார் புராணம்
5. அம்பராமபுராணம் - கைகேசி மூலிணைப் புகை

அககு : 3

6. சீராமபுராணம் - நடு அகநாடுப் புகை - 24 வரிசை
7. தேய்வகணி - வாயல் ஆட்சி புகை - முதல் 5 பாடல்கள்

அககு : 4

8. நளவெண்பா - வயல்வர காண்டம் (20 - 51)

அககு . 5 : இலக்கிய வரலாறு

9. அட்வியர்ஸ்ச் , ஐக்கிறு அட்வியர்ஸ்ச் , புராணங்கள் , இதிராசங்கள்

CourseCode	CourseTitle	L	T	P	C
19111AEC31	AdvancedEnglish-III	4	0	0	2

**Aim:**

- ToimprovetheknowledgeofEnglish

**Objective:**

- To familiarizewiththe organsofspeechandthedescriptionandclassificationofspeech sounds
- To understandconsonantcluster,syllable,wordaccentand intonation.
- Toknowhowtointerpret graphics
- Towriteslogansand advertisements

**Outcome:**

- UnderstandPhonetics
- Developwritingskill

**UNIT –I**

The organs of  
speechClassificationofspeechsoun  
dsVowels and Diphthongs

**UNIT –II**

Consonants  
Consonant cluster

**UNIT– III**

SyllableWor  
daccentInto  
nation

**UNIT– IV**

Idiom  
Interpretationofgraphics

**UNIT– V**

Slogan  
writingWritingadverti  
sement

**References:**

English Grammar -Wren and Martin  
English Grammar and Composition -RadhakrishnaPillai  
Technical Communication -MeenakshiSharma&SangeethaSharma  
A text book of Phonetics for Indian Students-T.B. Balasubramaniyan

CourseCode	CourseTitle	L	T	P	C
19111AEC32	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- 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

**References:-**

Nine Short Stories -Steuart H.King Blackie Books  
 One-Act plays of Today -T.Prabhakar Emerald Publishers

## CoreV -NUMBER THEORY

Coursecode	CourseTitle	L	T	P	C
19112AEC33	Core-VNumberTheory	5	0	0	5

### 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.

### UNIT1:

**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.

### UNIT2:

**ARITHMETICAL FUNCTIONS AND DIRICHLET MULTIPLICATION:-** The Möbius function  $\mu(n)$  — The Euler totient function — A relation connecting  $\phi$  and  $\mu$  — A product formula for  $\mu(n)$  — The Dirichlet product of arithmetical functions — Dirichlet inverses and the Möbius inversion formula — the Mangoldt function  $\Lambda(n)$  — Multiplicative functions — Multiplicative function and Dirichlet multiplication.

### UNIT3:

**AVERAGES OF ARITHMETICAL FUNCTIONS:-** The big O 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  $\phi(n)$ .

### UNIT4:

**SOME ELEMENTARY THEOREMS ON THE DISTRIBUTION OF PRIME NUMBERS:-** Chebyshev's function  $\psi(x)$  and  $\vartheta(x)$  - Relations connection  $\vartheta(x)$  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  $\sum_{p_n \leq x} (1/p)$  - the partial sums of the Möbius function.

### UNIT5:

**CONGRUENCES:-** Definition and basic properties of congruence's — Residue classes complete residue systems — Linear congruence's — Reduced residue systems — Ruler Fermat's Theorem — Polynomial congruence's module Lagrange's theorem — Applications of Lagrange's Theorem — Chinese Remainder theorem.

### Reference:

Introduction to Analytic Number Theory by Tom. M. Apostol

**ForUnit1-Chapter1**

**ForUnit1-Chapter2**

**ForUnit1-Chapter3**

**ForUnit1-Chapter4Section4,1to4.9only**

**ForUnit1-Chapter5**

**GeneralReference:**

1. Numbertheory: GeorgeE.Andrews
2. IntroductiontotheoryofNumber:G.H.I-lardyandE.M.Wright.
3. BasicNumber Theory:S.B.Malilk.
4. ElementsofNumber Theory:S.KumaraveluandSusheelaKumaravelu.

**Learning Outcomes:**

Onsatisfyingtherequirementsofthiscourse,studentswillhavetheknowledgeandskillsto:

- ✓ Solveproblems inelementarynumbertheory
- ✓ Applyelementarynumbertheorytocryptography
- ✓ Developadeeper conceptualunderstandingofthetheoreticalbasisofnumber theoryand cryptography
- ✓ Defineand interprettheconceptsofdivisibility,congruence,greatestcommondivisor, prime, and prime-factorization,

## Core VI-NUMERICAL ANALYSIS

Coursecode	CourseTitle	L	T	P	C
19112AEC34	Core –VI Numerical Analysis	4	0	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, solution of simultaneous equations, solution of ordinary differential equations. Solution of Linear systems, Numerical differentiation and integration interpolation with equal & unequal intervals are concentrated.

**UNIT1:** Solution of Algebraic and transcendental equation iterative method, Bisection method, Aitken's process Method of False Position, Newton-Raphson methods.

### UNIT2: Finite differences-

Forward differences backward differences Central differences symbolic rel

ations. Newton's formula for interpolation.  
Interpolation with unevenly spaced points

Lagrange's interpolation formula-divided differences and their properties-Newton's General interpolation formula.

### UNIT3: Numerical differentiation and integration

Numerical differentiation—integration—Trapezoidal rule and Simpson's rule.

### UNIT4: Solution of Linear systems

Gaussian Elimination method — Iterative methods Jacobi and Gauss seidal Methods.

**UNIT5:** Numerical solution of Ordinary—Differential Equations. Solution by Taylor's series — Picard's method of successive approximations —Euler method Modifies Euler's method—Runge Kutta methods—Predictor Corrector methods —Adams method and Mines method.



**TextBook****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 transcendental equations
- Understanding about finite differences
- Students develop and analyze numerical techniques
- Applying various numerical methods to solve ordinary differential equations
- Students get the research inquiry and analytical thinking abilities

## ALLIEDII-PAPER1-MATHEMATICALSTATISTICSI

Coursecode	CourseTitle	L	T	P	C
19118AEC3 5	Allied–II–Paper–I–Mathematical StatisticsI	3	0	0	3

### 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, chi-square distribution and sampling distributions Tchebychev's inequality and weak law of large numbers — Simple form of central limit theorem for i.i.d random variables. Construction and uses of fixed and chain based index numbers — Simple and Weighted index numbers 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:

Tchebychev's inequality and weak law of large numbers — Simple form of central limit theorem for i.i.d random variables.

### UNIT V:

Index numbers and their definition—Construction and uses of fixed and chain based index numbers — Simple and Weighted index numbers.

### Reference:

1. Fundamentals of Applied Statistics — S.C.Gupta and V.K.Kapoor. Sultan Chand & Sons.
2. Fundamentals of Mathematical Statistics — S.C.Gupta and V.K.Kapoor, Sultan Chand & Sons.

## **Learning outcomes**

By the end of this course, you should:

- Students get 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 central limit theorem for i.i.d random variables.
- Knowledge of constructions and uses of fixed and chain based index numbers

## ALLIEDII—PAPERII-MATHEMATICALSTATISTICSII

Coursecode	CourseTitle	L	T	P	C
19118AEC36	Allied–II–PaperMathematicalStatisticsII	3	0	0	3

### 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 Karl Pearson's Correlation coefficient and its properties Linear Regression and its properties, Test of significance would be taught.

### UNIT I:

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.

### UNIT II:

Point estimation, Properties of point estimate Neyman's Factorization theorem (Statement only) methods of moments and maximum likelihood estimation — Properties of these estimators based on these two methods.

### UNIT III:

Interval estimation — 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 IV:

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.

### UNIT V:

Design and Experiments.

### Reference:

1. Fundamentals of Mathematical Statistics — S.C. Gupta and V.K. Kapoor, Sultan Chand.
2. Fundamentals of Applied statistics - S.C. Gupta and V.K. Kapoor, Sultan Chand & Sons.

### Learning outcomes

By the end of this course, you should:

- Students learning statistical techniques and statistical data
- Understood the concept of correlation and regression
- Acknowledge test of significance based on parametric and non-parametric test
- Students get the methodology for the planning and execution for any scientific enquiry

## RESEARCH METHODOLOGY

Coursecode	CourseTitle	L	T	P	C
19112RMC37	ResearchMethodology	3	0	0	3

### 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, 2<sup>nd</sup> 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, Sanjaya S.Gaur, Statistical Methods for Practice and Research, Response, 2009

## PackageLab-111

### POWER POINT

CourseCode	CourseTitle	L	T	P	C
19120SEC03AL	PackagesLab-III	0	0	2	1

1. Createasideshowpresentationforaseminar(choose yourowntopics)
  - a. Enterthetextintheoutline view
  - b. CreateNon-bulletedandbulletedtext
2. Createasideshowpresentationforascienceexhibition
  - a. CreateNon-bulletedandbulletedtext
  - b. Applyappropriatetextattributes
3. Createsideshowpresentationforan invitation
  - a. Insertanobject fromabitmapfile
  - b. Applyappropriatetextattributes
  - c. Rotatetheobjectto45 degree
  - d. Applyshadowtotheobject
4. Createasideshowpresentationtodisplaypercentageofmarksineachsemester forall students
  - a. Usebarchart(x-axis:semester;y-axis:%ofmarks)
  - b. Usedifferentpresentationtemplateanddifferenttransitioneffectfor eachslide
  - c. Usedifferent textattributesineachslide
5. Createasideshowpresentationforashopadvertisementtobeopenshortly
6. Createasideshowpresentationtodisplaypercentageofsalesin eachquarter fortheany vendor using bar chart (x-axis: Quarter; y-axis: % of sales)
7. Createasideshowpresentationforatouristsplaces
8. Createaslideforcalendarusingappropriatetextattributesand insertanobjectfroma bitmap file

CourseCode	CourseTitle	L	T	P	C
19160SEC03B	SOFTSKILLIII	0	0	2	1

### **Part-III Interpersonal Relations and Social Responsibilities**

#### **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.

CourseCode	CourseTitle	L	T	P	C
19111SEC03L	CommunicativeEnglish-III	0	0	2	1

**Aim:**

- Toacquaintwiththebasicgrammar

**Objective:**

- To familiarizewiththe clausesandphrases
- Tolearnthedifferentdegreesofcomparison
- Tochangeasentencefromactivetopassiveandvice versa
- To knowwheretouse punctuations
- To frame sentences
- Toknowthefeatures,process,formsandbarriersofcommunication

**Outcome:**

- Understandgrammar

**UNIT –I**

Clauses

Phrases

**UNIT –II**

Degrees of comparison

**UNIT –III**

ActiveandPassive

**UNIT –IV**

Communication

Characteristics-Process-Forms-Barriers

**UNIT –V**

Punctuation

Forming sentences

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

-Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma



## SEMESTER- IV

மேலும் இவற்றினால் பன்னாட்டுக்கழகம் கல்வி, தஞ்சாவூர்

பல. குடியாடு :தமிழ்.

நாங்கள் பருவம் இரண்டாம் ஆண்டு

கேள்விகள் , சர்க இலக்கியம், சிறு இலக்கியம் , கெய்கொழி , இலக்கிய வரலாறு

பகுதி . 1 : பன்னாட்டு இலக்கியம் - நன்றினை;

1. கெய்கொழி - கேள்வி கூற்று - பட்டம் எண் . 11
2. குறியீடு - தகவல் கூற்று - பட்டம் எண் . 64
3. பருவம் - தகவல் கூற்று - பட்டம் எண் . 142
4. பருவம் - நன்றி கூற்று - பட்டம் எண் . 29
5. கெய்கொழி - தகவல் கூற்று - பட்டம் எண் . 70

பன்னாட்டு இலக்கியம் குறியீடுகளை

- 1 . குறியீடு - கேள்வி கூற்று - பட்டம் எண் .1
2. பருவம் - கெய்கொழி, தகவல் கூற்று - பட்டம் எண் .167
3. கெய்கொழி - தகவல் கூற்று - பட்டம் எண் . 181
4. கெய்கொழி - தகவல் கூற்று - பட்டம் எண் . 290
5. பருவம் - தகவல் கூற்று - பட்டம் எண் . 347

பன்னாட்டு இலக்கியம் ஓர் குறியீடு

1. கெய்கொழி - கல்வி பகுதி - பருவம் இரண்டு பட்டங்கள்
2. கெய்கொழி - கேள்விக் குறியீடு பகுதி - பருவம் இரண்டு பட்டங்கள்
3. குறியீடு - குறியீடு குறியீடு பகுதி - பருவம் இரண்டு பட்டங்கள்
4. பருவம் - இரண்டாம் பகுதி - பருவம் இரண்டு பட்டங்கள்
5. பருவம் - பருவம் பகுதி - பருவம் இரண்டு பட்டங்கள்

பகுதி . 2 : கெய்கொழி

- 1 . பருவம் - பட்டம் எண் . 2
2. குறியீடு - பட்டம் எண் . 37

CourseCode	CourseTitle	L	T	P	C
19111AEC41	AdvancedEnglish-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

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

CourseCode	CourseTitle	L	T	P	C
19111AEC42	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

### Core-VI SEQUENCE AND SERIES

Coursecode	CourseTitle	L	T	P	C
19112AEC43	Core-VI SEQUENCE AND SERIES	4	0	0	4

**UNIT1:**

Sequence, Limits, Convergence-Cauchy's general principle of convergence-Cauchy's first theorem on Limits-Bounded sequences-Monotonic sequence always tend to a limit, finite or infinite-Limit superior and limit inferior.

**UNIT2:**

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.

**UNIT3:**

Cauchy's condensation test, Cauchy's root test and their simple problems Alternating series with simple problems.

**UNIT4:**

General summation of series including successive difference and recurring series.

**UNIT5:**

Inequalities-Geometric and Arithmetic means Weierstrass inequalities-Cauchy's inequality.

**TEXTBOOK:**

Algebra Volume I & IIT. K.M. Pillai (Relevant problem 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

### Core VIII-OPERATIONS RESEARCH

Coursecode	CourseTitle	L	T	P	C
19112SEC44	Core-VIII Operations Research	4	0	0	4

**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.

**UNIT1:**

Introduction to operations Research—Elementary treatment of linear programming simplex Method  $<, =, >, =$  constraints.

**UNIT2:**

Application to Transportation problem - Transportation Algorithm - Degeneracy in Transportation problem, unbalanced transportation problem, Assignment problem - The assignment algorithm - unbalanced assignment problem.

**UNIT3:**

PERT and CPM network—critical and subcritical jobs—Determining the critical path. Network calculation PERT networks probability aspect of PERT —PERT time — PERT cost (omitting Crashing)

**UNIT4:**

Sequencing problem: Processing of  $n$  jobs through 2 machines - processing  $n$  jobs through 3 machines - processing 2 jobs through  $m$  machines  
 Games Theory: Characteristics of games —Maximin, Minmax, criteria of optimality — Dominance property - Algebraic and graphical method of solution of solving  $2 \times 2$  games.

**UNIT5:**

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 shortages.

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 bookwork]

**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 get the knowledge about inventory theory

## Core IX-ASTRONOMY

Coursecode	CourseTitle	L	T	P	C
19112SEC45	Core-IX Astronomy	4	0	0	4

### 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:

Kepler'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 librations)-Motions of planet (assume that orbits are circular- Eclipses

### Reference

(1) S.Kumaravelu and Prof. Susheela Kumaravelu, Astronomy, SKV Publications, 2004

UNIT-I — Chapter 1 & 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 — Chapter 12, 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

## ALLIEDII-PAPERIII-MATHEMATICALSTATISTICS-III

Coursecode	CourseTitle	L	T	P	C
19118AEC4 6	Allied –II–Paper–III–Mathematical StatisticsIII	3	1	0	3

### 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 various discrete and continuous distributions, and sampling distributions would be taught.

### UNITI:

Bivariate distribution—discrete and continuous, marginal and conditional distribution, Statistical independence, Conditional expectation.

### UNITII:

Binomial, Poisson, Negative binomial, geometric distribution—Constants, moment generating function, Cumulant generating function.

### UNITIII:

Normal distribution—Constants, mgf Binomial, Poisson and Chi—square distribution tending to normal — Statement of Central limit theorem. Statement of Uniqueness theorem and Continuity theorem.

### UNITIV:

Continuous distribution—rectangular, exponential, beta, gamma distributions.

### UNITV:

Sampling distributions—F, T and Chi—Square distributions—Relations b/w F and T distributions, Relation b/w F and Chi — Square distributions.

### Reference

Fundamentals of Mathematical Statistics. S.C. Gupta and V.K. Kapoor, Sultan Chand.

### Learning outcomes

By the end of this course, you should:

- learned statistical techniques and statistical data
- Understood the concept of various distributions
- Knowledge of test of significance based on parametric and non-parametric test
- Design/development of solutions
- Understood the concept of sampling theory



## ALLIED-II PRACTICAL MATHEMATICAL STATISTICS

Coursecode	CourseTitle	L	T	P	C
19118AEC47L	Allied-II- Practical- Mathematical Statistics	0	0	2	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, chi-square distribution and sampling distributions would be taught.

### List of Practical's

1. Measures of Central tendencies and measures of dispersion.
2. Moments, Skewness and Kurtosis.
3. Fitting of binomial distribution.
4. Fitting of Poisson distribution.
5. Fitting of Normal distribution.
6. Correlation.
7. Regression.
8. Goodness of fit.
9. Attributes, Contingency table.
10. Large sample tests.
11. t—tests.
12. Variance tests.
13. ANOVA.
14. Design of Experiments.

### Learning outcomes

By the end of this course, you should:

- Students learned statistical techniques and statistical data
- Understand the concept of various distributions
- Acknowledge of test of significance based on parametric and non-parametric test
- Design/development of solutions

## PackageLab-IV

### MS-ACCESS

CourseCode	CourseTitle	L	T	P	C
19120SEC04AL	PackagesLab-IV	0	0	2	1

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the university exams
3. Create a database for sorting the date of joining by the employee in the organization.
4. Create queries to select records that match specific conditions
5. Create relationships among the different tables
6. Create queries using built-in functions
7. Develop forms to enter data into the student marks database
8. Develop forms to enter data into the employee database

CourseCode	CourseTitle	L	T	P	C
19160SEC04B	SOFTSKILLIV	0	0	2	1

## **PART-IV Etiquette and Interviewing Skills**

### **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.

CourseCode	CourseTitle	L	T	P	C
19111SCE04L	CommunicativeEnglish-IV	0	0	1	1

**Aim:**

- Todevelopcommunicativeskills

**Objective:**

- Tousegerundandmakesentences
- Tochangesentences fromdirecttoindirectandviceversa
- Tounderstandthelisteningskill
- Toenhancereadingskill
- Tofamiliarizewiththesingularandpluralforms
- Todescribeapicture

**Outcome:**

- Understandgrammar
- Developlisteningandreadingskills

**UNIT –I**

GerundIn

finitiveU

**UNIT –II**

Direct andIndirect

**UNIT –III**

Listening-types-featuresofagoodlistener-activeandpassivelistingening-effectivelistingening

**UNIT –IV**

Reading-purpose-technique-types-readingrates-reading&interpretation

**UNIT –V**

SingularandPluralLet

ter writing

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

-Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma

## GLOBARENASOFTWARE

### Objective:

- To hone LSRW skills through emerging techniques
- To comprehend meaning from text to words
- To cultivate the habit of reading
- To make the students proficient in pronunciation
- To improve the listening skill

### Outcome:

- Develop LSRW skills

Phonetics

Listening Comprehension

Reading Comprehension

Word Mentor-Level I & II

- Words and their meaning
- Root and usage
- Fill in the blanks
- Synonyms
- Antonyms
- Match the Words

### Lab Note:

Word Mentor-Level I & II

Listening Comprehension

Reading Comprehension

Newspaper Article

### Viva:

Listening Comprehension

Reading Comprehension

### Exam Components

Theory exam	50
Lab note	10
Listening Comprehension	20
Reading Comprehension	20
Total	100

### Theory exam pattern:

Section A	$10 \times 2 = 20$
Section B	$2 \times 15 = 30$
Total	$= 50$

## ENVIRONMENTAL STUDIES (for undergraduate students)

Coursecode	CourseTitle	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

### 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 groundwater, 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 individual 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 Ghats 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. FieldWork

Visittoalocalareatodocumentenvironmentalassets—River/Forest/Grassland/Hill / Mountain.

or

Visittoalocalpolluted site—Urban/Rural/Industrial/ Agricultural.

or

Studyofcommonplants,insects,birds.

or

Studyofsimpleecosystems—ponds,river,hillslopes,etc.

## References:

- 1) Agarwal,K.C.,2001,EnvironmentalBiology,NidiPub. Ltd.,Bikaner.
- 2) Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: [rn4pin@icenet.net](mailto:rn4pin@icenet.net) (R)
- 3) BrunnerR.C., 1989, HazardousWasteIncineration, McGrawHillInc. 480p
- 4) ClankR.S.,MarinePollution,ClandersonPressOxford(TB)
- 5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, 1196p
- 6) DeA.K.,EnvironmentalChemistry,WileyWasternLtd.
- 7) DowntoEarth,CentreforScienceandEnvironment,NewDelhi.(R)
- 8) Gleick, H., 1993, Water in crisis, Pacific Institute for studies in Dev., Environment & Security. Stockholm Env Institute. Oxford Univ. Press 473p
- 9) HawkinsR.E.,EncyclopediaofIndianNaturalHistory,Bombay NaturalHistory Society, Bompay (R)
- 10) Heywood,V.K.&Watson,R.T.1995,GlobalBiodiversityAssessment,Crnbridge Univ. Press 1140 p.
- 11) Jadhav, H. and Bhosale, VJvI. 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) MillerT.G.Jr.EnvironmentalScience. WadsworthPublicationsCo. (TB).
- 14) Odum,E.P.1971, FundamentalsofEcology,W.B.SaundersCo. 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) SurveyoftheEnvironment,TheHindu (M)
- 18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)
- 19) Trivedi R.K. HandbookofEnvironmentalLaws, Rules, Guidelines, CompliancesandStandards,vol. IandII,EnvironmentalMedia(R)
- 20) TrivediR.K.andP.K.Goel,Introductiontoairpollution,Techno—Science Publications (TB)
- 21) WagnerK.D.,1998,Environmentalmanagement,W.B.SaundersCo. Philadelphia, USA 499p,
- 22) Paryavaranshastra—GholapT.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.

**SEMESTER– V**  
**CoreX.MODERNALGEBRA**

Objectives:

Algebraic structures like Groups, Rings, and Vector spaces are studied. The existence of subgroups of given order and the number of such subgroups are studied. The properties of

Coursecode	CourseTitle	L	T	P	C
19112AEC51	Core-X-ModernAlgebra	6	0	0	6

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.

**UNIT1:**

Permutation Groups -SubGroups—Cosets and Lagrange's theorem

**UNIT2:**

Normal subgroups-Quotient groups.-Homeomorphisms–Isomorphism

**UNIT3:**

**RING THEORY:**

Definition and Examples of Rings — some special Classes of Rings — Homeomorphisms - Ideals and Quotient Rings — More ideals and Quotient Rings — Euclidean Rings.

**UNIT4:**

**VECTOR SPACE:**

Elementary Basic concepts — Linear independence and Bases and spaces- Inner product Spaces

**UNIT5:**

**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. Sand Isaac. A.T (Second edition)

**For UNIT1-**Chapter3: Section3.4 to 3.8

**For UNIT2-**Chapter3: Section3.9 to 3.11

**For UNIT3-**Chapter4: Section4.1 to 4.14

**For UNIT4-**Chapter5: Section5.0 to 5.6

**For UNIT5-**Chapter5: Section5.7 to 5.8, Chapter6 section6.0 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

## CoreXI-REALANALYSIS

Coursecode	CourseTitle	L	T	P	C
19112AEC52	Core–XI-RealAnalysis	6	0	0	5

### 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.

### UNIT1:

**BASICTOPOLOGY:-**Finite, countable and uncountable sets — Metrics spaces — Compact spaces — Perfect sets — Connected sets.

### UNIT2:

**NUMERICALSEQUENCESANDSERIES:-**Convergent sequences-Subsequence's — Cauchy Sequences — Upper and Lower limits — some special sequences — Series — Series of Nonnegative Terms — The Number E — The Root and Ratio Tests — Powerseries — Summation by parts -Absolute convergence — Addition and Multiplication of series.

### UNIT3:

**CONTINUITY:-**Limits of functions — continuous functions — Continuity and compactness — Continuity and connectedness — Discontinuity — Monotonic functions — Infinitelimits and limits at infinity.

### UNIT4:

**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.

### UNIT5:

**THERIEMANN-INTEGRALS:-**Definition and Existence of the Integral — Properties of the Integral — Integration and Differentiation.

### Reference:

Principles of Mathematical Analysis by Walter Rudin, McGraw Hill.

**For UNIT1-**Chapter-2

**For UNIT2-**Chapter-3 (section 3.1 to 3.50)

**For UNIT3-**Chapter-4

**For UNIT4-**Chapter-5

**For UNIT5-**Chapter-6

### General References:

1. Real Analysis: Bartle and Schurhast.
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
- Analyse the problem and finding the solution

## CoreXII-STATICS

Coursecode	CourseTitle	L	T	P	C
19112SEC53	Core–XII– Statics	4	1	0	5

### 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-I

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–Lawsoffriction-Coefficient offriction, 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–Equilibriumofstringundergravity–commoncatenary- suspensionbridge.

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, Agasthir publication, 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-PROGRAMMINGinC++

Coursecode	CourseTitle	L	T	P	C
19112SEC54	Core-XIII-Programming inC++	4	0	0	4

### 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)

### Reference

Object oriented programming with C++ by E. Balagurusamy, 2e, Tarn. McGraw Hill publishing Co. Ltd., New Delhi.

### Reference

1. C++ The Complete Reference by Herbert Schildt.
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 use 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

### Elective1-FUZZYANALYSIS

Coursecode	CourseTitle	L	T	P	C
19112DSC55 A	ElectivePaper– IFuzzyAnalysis	5	0	0	4

#### 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 -  $\alpha$ -cuts - additional properties of  $\alpha$ -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 operation 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, NEW DELHI, 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

Coursecode	CourseTitle	L	T	P	C
19112DSE55B	Elective Paper-I-Formal Languages and Automata Theory	5	0	0	4

### 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 NFA — 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.

## PackageLab-V

### PHOTOSHOP

CourseCode	CourseTitle	L	T	P	C	Marks
19120SEC05AL	PackagesLab-V	0	0	2	1	100

1. Designa Visitingcard.

2. Designa Identitycard.

3. Designa letterpad with LOGO.

4. Create an advertisement for Newspaper and Poster creation.

5. Designa calendar with pictures.

6. Designa Magazine.

7. Create a frontpage for a Magazine.

8. Designa CD Cover.

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC05B	SOFTSKILLV	0	0	2	1

## **PART-V Leadership Skills and Body Language**

### **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 counselling, 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

CourseCode	CourseTitle	L	T	P	C
19111SEC05L	CommunicativeEnglish-V	0	0	2	1

**Aim:**

- Todevelopcommunicativeskills

**Objective:**

- Todevelop vocabulary
- Tocomprehend meaningfromcontext
- Toinvolveina dialogue
- Tonotetheimportantpointsfromthetext.
- Towrite a letter
- Tounderstandthesubjectverbageement
- Toteachthedifferentgenders

**Outcome:**

- Developcommunicativeskills

**UNIT –I**

CorrectthespellingmistakesCompr  
ehension

**UNIT –II**

FindtheoddoneoutPi  
cture description

**UNIT–III**

AbbreviationsNot  
e making

**UNIT –IV**

GenderDialogue  
writing

**UNIT –V**

AcronymsCo  
ncord

**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

# GLOBAL ENAS SOFTWARE

## Objective:

- To boost the confidence level of the learners in communicating English in the day to day activities
- To enhance the vocabulary
- To present an idea
- To familiarize the technical teaching tools that support language learning

## Outcome:

- Develop communicative skill

## Vocabulary

- Anagrams
- Word traps
- Beastly words
- Stinging words
- Confusing words
- Guess the word
- Cross words

## Word families

## Picture talk

## Lab Note:

Vocabulary exercises

## Viva:

Picture Talk

Vocabulary exercises

## Exam Components

Theory exam	50
Lab note	10
Picture description	20
Vocabulary	20
Total	100

## Theory exam pattern:

Section A	$10 \times 2 = 20$
Section B	$2 \times 15 = 30$
Total	$= 50$

## SEMESTER-VI

### CoreXIV- COMPLEX ANALYSIS

Coursecode	CourseTitle	L	T	P	C
19112AEC61	Core-XIV-ComplexAnalysis	5	0	0	5

#### 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: AnalyticFunctions:

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. Phillips.
3. Complex Variable by Dr. P.P. Gupta Kedar Nath Ram Nath Meerut—Delhi.
4. Functions of Complex Variable by J.N. Sharma Krishna Prakashan Mandir 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.

## CoreXV -DYNAMICS

Coursecode	CourseTitle	L	T	P	C
19112SEC62	Core–XV Dynamics	4	0	0	4

### 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-Loads 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 spheres –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.

#### TEXTBOOKS:

1. P.DURAI PANDIAN, VECTOR TREATMENT AS IN MECHANICS,  
Unit-I-Chapter 1 & 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. Viswanath Naik and Dr.M.S.Kasi.

#### Course Outcomes:

Students who successfully complete the course will demonstrate the following outcomes by tests, homework, and written reports:

1. A knowledge of internal forces and moments in members.
2. An ability to calculate centroids and moments of inertia.
3. A knowledge of kinematic and kinetic analyses and energy and momentum methods for particles and systems of particles.
4. A knowledge of kinematic and kinetic analyses and energy and momentum methods for rigid bodies.

## CoreXVI –DISCRETE MATHEMATICS

Coursecode	CourseTitle	L	T	P	C
19112AEC63	Core-XVIDiscreteMathematics	4	0	0	4

### 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.

### UNIT1 :

#### 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 – Composition of Functions

### UNIT2:

#### 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

### UNIT3:

#### LATTICES AND BOOLEAN ALGEBRA

Lattices – Some Properties of Lattices – New Lattices – Modular and Distributive  
Lattices – Boolean algebra

### UNIT4:

#### RECURRENCE RELATIONS AND GENERATING FUNCTIONS:

Recurrence an introduction – Polynomials and their Evaluations – Recurrence Relations –  
Solution of Finite Order Homogeneous (linear) Relations – Solution of Non-homogeneous  
Relations – Generating Functions – Some Common Recurrence Relations – Primitive  
Recursive Functions – Recursive and Partial Recursive Functions

### UNIT5:

#### 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 study on ordering relations.

## CorePractical—ProgramminginC++

Coursecode	CourseTitle	L	T	P	C
19120SEC64L	CorePractical- ProgramminginC++	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,  $e^x$ ), Fibnoacci Numbers using recursive functions, Sorting of given names in alphabetical order, Matrix Operations (Addition,Subtraction, Multiplication — use functions) would be taught.

1. BankTransaction

2. ShapesUsingPolymorphism

3. a)SingleInheritance

b)MultilevelInheritance

4. Inline

Function5, Friend

Function

6. a)VirtualBase Class

b)VirtualAbstractFunction

7. StringHandling

8. DisplayFileWithLines

9. MarklistPreparation

10. InventoryPreparation

### Learning outcomes

Bytheendofthiscourse,you shouldbeable

- Studentslearnedprogramtechniques
- Understandtheconceptofvariousfunctions
- Aknowledgeofwriting C++ program
- Design/developmentofsolutions

## ElectiveII-GRAPH THEORY

Coursecode	CourseTitle	L	T	P	C
19112DSC65 A	ElectivePaper–IIGraphTheory	5	0	0	4

### 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 20 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 andpendent vertices — isomorphism — sub graphs — walks, puths and circuits — Connected and disconnected graphs — components — Euler graphs — Operations ongraphs — more on Euler graphs — Harniltonian paths and circuits.

**UNIT 2:** Trees — Properties of trees — pendent vertices in a tree — distances and centers in atree — Rooted and binarytrees — Spanning trees — fundamentalCircuits — Findingall 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 andcut-sets — connectivity and reparability.

**UNIT 4:** Planar graphs — Knratowski'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 Fundamentalcircuit and matrixandrankofthecircuit matrix— cut-set matrix— Adjacencymatrix.Chromatic number — Chromatic partitioning — Chromatic polynomial.

Treatment and content as in “Graph Theory with applications to engineering andcomputer science” by Narsing Deo, Prentice Hall of India, New Delhi.

### References:

1. Invitationto graphTheory’byDr.S.Arumugamand Dr.S. Ramachandran.
2. ‘GraphTheory’—F.E-Haray,NarosaPublishingHouse,NewDelhi—Madras-Bombay.
3. GraphTheory—S.A. Choudum,MacmillanIndiaLimited—NewDelhi—Madras.

### Learning outcomes

Bytheendofthiscourse,you shouldbeable

- KnowledgeinGraphTheory
- UnderstandingthepropertiesofGraphTheory
- UnderstandingtheconceptofKuratowski'sgraph
- UnderstandingMatrixrepresentationofgraphs

## ElectiveII- MATHEMATICALMODELLING

Coursecode	CourseTitle	L	T	P	C
19112DSC65B	ElectivePaper–IIMathematicalModelling	5	0	0	4

### 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:

MATHEMATICALMODELLING, J.N.KAPUR, WILEY EASTERN LIMITED, NEW DELHI, 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
-

CourseCode	CourseTitle	L	T	P	C
19111OEC	OpenElective-Journalism	4	0	0	2

**Aim:**

- To acquaint with the basic knowledge of journalism so that it may entice 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	CourseTitle	L	T	P	C
19112OEC	OpenElective: Development ofMathematicsSkills	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"

CourseCode	CourseTitle	L	T	P	C
19113GEC	OpenElective- 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-amp 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 type 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.

Sawhney – Dhanpat Rai and Sons – 1990.

Electronic Measurements and Instrumentation – Oliver C. Sage – McGraw Hill – 1975.



CourseCode	CourseTitle	L	T	P	C
19114OEC	OpenElective-FoodandAdulteration	4	0	0	2

**Aim:**

- To introduce students to food safety and standardization 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 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.

**References:**

1. The Food Safety and Standard ACT, 2006–Seth & Capoor
2. Handbook of Food Adulteration and Safety Laws– Sumeet Malik
3. Food Science– B. Srilakshmi

CourseCode	CourseTitle	L	T	P	C
19117OEC	OpenElective-MushroomTechnology	4	0	0	2

**Aim:**

- Mushrooms represent microbial technology that recycles agricultural residues into food and manure
- Mushroom technological interventions aim 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 – *Calocybe indica*, *Volvariella Volvacea*, *Pleurotus* sp., *Agaricus bisporus*

**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, Bappa Co. The Bangalore Printing and Publishing Co. Ltd., Bangalore.

CourseCode	CourseTitle	L	T	P	C
191200EC	OpenElective -WebTechnology	4	0	0	2

**Aim:**

- To equip the students with basic programming skill in Web Designing

**Objective:**

- To understand and practice markup 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 webpage 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.

CourseCode	CourseTitle	L	T	P	C
19122OEC	OpenElective-E-Commerceandits Application	4	0	0	2

**Aim:**

- Toorganizeandpromotetheexchangeofinformationoncommunicationprotocolsand information exchange mechanisms for Electronic Commerce.

**Objectives:**

- TobeawareofallaspectsofcommunicationandinformationexchangeinElectronic Commerce, including:
  - Navigation,brokerage, advertisingandcatalogueexchangeinpre-salesactivities.
  - Negotiationandcontractmakingprotocolsininteractionsbetweenconsumers, businesses, and public administration.
  - Secureexchangeofdocuments,content and valueinopentradingprotocols.
  - Communicationplatforms for thee-Economy, includinge-commerce, e-businessand e-government.

**Outcomes:**

- Secureexchangeofdocuments,contentandvalueinopentrading protocols.
- Communicationplatformsforthee-Economy,includinge-commerce,e-businessande-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 – AdvantagesofE-Commerce- DisadvantagesofE-commerce-Online Extensionofa 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’Sechoupal

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 Technologiesofthe 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 BrowsingBehaviour 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-Bankingat ICICBank-Mainconcernsininternet baking-History'slesson 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 systemonthe Internet-risk and E-payment system-Designing E-payment system-digital signature-online financial service in India-online stock trading: The high speedalternative.

### **ReferenceBook:**

“E-Commerce:AnIndianPerspective”P.T.Joseph,S.J.Third Edition

CourseCode	CourseTitle	L	T	P	C
19161OEC	OpenElective–IndirectTaxes	4	0	0	2

**Aim:**

- Toacquaintwiththeknowledgeofindirecttaxes

**Objectives:**

- Tomakethestudentstogainexpertknowledgeinindirect taxes.
- Tohavepracticalknowledgeonexcisedutiesandcustoms duties.
- Tolearnthefundamentalsoservicetax, saletaxandVATS.

**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**

ObjectivesofTaxation- contributionto Government revenue- cannonsofTaxation– Taxsystem in India – Direct and Indirect taxes Advantages and DisadvantagesofIndirect taxes.

**UNIT– II**

Central Excise Duty – Meaning -Levy and collection - Distinction between Excise duty and Customs Dutyand Sales Tax.Types ofexcise 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**

ValueAddedTax(VAT)

Meaning ofVAT, Justification ofVAT – VAT and Sales Tax Advantages and Disadvantages of VAT.Methods of Calculating VAT Levy of VAT and Types of VAT.

**ReferenceBooks:**

- Income Tax Law and Practice- N.Hariharan.
- BusinessTaxation–T.S.Reddy/HariPrasadReddy.

## PackageLab-VI FLASH

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC06AL	PackagesLab-VI	0	0	2	1

1. Drawingandpainting originalart inflash.
2. Creatingsimpleobjectsusing flash.
3. Creatingaframe-by-frameanimationtechniques.
4. Developaprogram foranimationwithmotionTwenning.
5. Developaprogram foranimationwithshapeTwenning.
6. Develop aprogram foraddingsoundtoyourmovies.
7. CreateasimpleBanner.
8. Createasimpleanimationstechniquesmovieclipandgraphicsymbols.



<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC06B	SOFTSKILLVI	0	0	2	1

## **PART-VI LifeSkills and Other Skills**

### **UNIT I            LifeSkills**

**LifeSkills-** Knowshowto 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            OtherSkills**

#### **Other Skills**

Meditation.Improving personal memory, StudyskillsthatincludeRapidReading,Notes Taking, Self learning, Complex problem solving and creativity.

CourseCode	CourseTitle	L	T	P	C
19111SEC06L	CommunicativeEnglishLab-VI	0	0	2	1

**Aim:**

- Todevelopcommunicativeskills

**Objective:**

- Toextractthemainideasfromatext
- Tounderstand themeaning oftext
- Toexpandan idea
- Toshortena text
- Todevelop vocabulary
- Toenhancewriting skills
- Towritesimple,compoundandcomplexsentences

**Outcome:**

- Developcommunicativeskills

**UNIT –I**

Jumbled words

Paragraphwriting

**UNIT –II**

Prefixandsuffix

Precise writing

**UNIT –III**

Eponyms

Summarizing

**UNIT –IV**

Compoundwords

Simple,CompoundandComplex

**UNIT –V**

Homophones

Essaywriting

**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





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**M.Sc.,  
MATHEMATICS(2019-  
REGULATION)**

# Department of Mathematics

<b>1.1.3</b>	<b>Colour</b>
	Employability
	Skill Development



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## M.Sc., MATHEMATICS – Regulation 2019

### COURSE STRUCTURE

SEMESTER – I					
COURSE CODE	COURSE TITLE	L	T	P	C
19212AEC11	Algebra	6	0	0	4
19212AEC12	Real Analysis	7	0	0	4
19212AEC13	Ordinary Differential Equations	6	0	0	4
19220SEC14	C++ Programming	6	0	0	4
19212DSC15	Discipline Specific Elective-I	5	0	0	4
19212RLC16	Research Led Seminar	1	1	1	1
<b>Total</b>		<b>30</b>	<b>0</b>	<b>0</b>	<b>21</b>

<b>SEMESTER–II</b>					
<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19212AEC21	Complex Analysis	5	1	0	3
19212AEC22	Measure Theory and Integration	5	0	0	3
19212SEC23	Mathematical Methods	6	0	0	3
19212AEC24	Differential Geometry	5	0	0	3
19212DSC25	Discipline Specific Elective-II	5	0	0	4
19212RMC26	Research Methodology	3	0	0	3
19212BRC27	Participation in Bounded Research	-	-	-	2
<b>Total</b>		<b>29</b>	<b>1</b>	<b>0</b>	<b>21</b>

<b>SEMESTER–III</b>					
<b>COURSECODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19212AEC31	Topology	6	0	0	5
19212SEC32	Stochastic Process	6	1	0	5
19212AEC33	Advanced Numerical Analysis	6	1	0	5
19212DSC34	Discipline Specific Elective-III	5	0	0	4
192__OEC35_	Open Elective	4	0	0	2
19212SRC36	Participation in Scaffold Research (Design/Societal Project)	-	-	-	2
<b>Total</b>		<b>27</b>	<b>2</b>	<b>0</b>	<b>23</b>

SEMESTER-IV					
COURSECODE	COURSE TITLE	L	T	P	C
19212AEC41	Functional Analysis	5	1	0	5
19212SEC42	Visual Programming	6	1	0	5
19212AEC43	Number Theory	6	0	0	5
19212DSC44	Discipline Specific Elective-IV	5	0	0	4
19212PRW45	Project Work	-	-	-	6
19212PEE	Programme for Exit Examination	-	-	-	2
<b>Total</b>		<b>22</b>	<b>2</b>	<b>-</b>	<b>27</b>

### DISCIPLINE SPECIFIC ELECTIVE COURSES

Semester	Elective No.	Course Code	Course Title
I	I	19212DSC15A	a) Classical Dynamics
		19212DSC15B	b) Fluid Dynamics
II	II	19212DSC25A	a) Mathematical Probability
		19212DSC25B	b) Mathematical Modelling
III	III	19212DSC34A	a) Cryptography
		19212DSC34B	b) Algebraic Coding Theory
IV	IV	19212DSC44A	a) Combinatorial Mathematics
		19212DSC44B	b) Design and Analysis of Algorithm

## OPENELECTIVESCOURSE

Semester	OPENELECTIVECOURSES
<b>III</b>	<b>a. 17211OEC-WritingForTheMedia</b> <b>b. 17213OEC–Biomedicalinstrumentation</b> <b>c. 17214OEC–GreenChemistry</b> <b>d. 17215OEC–BioanalyticalTechniques</b> <b>e. 17220OEC-InternetandWebDesign</b> <b>f. 17261OEC-InsuranceServices</b> <b>g. 17280OEC-CounsellingandPsychology</b>

### CreditDistribution

Sem	AEC	SEC	DSC	OEC	Research	others	Total
<b>I</b>	<b>12</b>	<b>4</b>	<b>4</b>	<b>-</b>	<b>1</b>		<b>21</b>
<b>II</b>	<b>9</b>	<b>3</b>	<b>4</b>	<b>-</b>	<b>5</b>		<b>21</b>
<b>III</b>	<b>10</b>	<b>5</b>	<b>4</b>	<b>2</b>	<b>2</b>		<b>23</b>
<b>IV</b>	<b>10</b>	<b>5</b>	<b>4</b>	<b>-</b>	<b>6</b>	<b>2</b>	<b>29</b>
<b>Total</b>	<b>41</b>	<b>17</b>	<b>16</b>	<b>2</b>	<b>14</b>	<b>2</b>	<b>92</b>



**SEMESTER– I**  
**Core I: ALGEBRA**

CourseCode	CourseTitle	L	T	P	C
19212AEC11	Core –I-Algebra	6	0	0	4

**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—polynomial 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. Knowledge of Linear Transformations.
  3. An understanding of the analysis of Fields.
  4. Research inquiry and analytical thinking abilities
-

## Core II: REAL ANALYSIS

CourseCode	CourseTitle	L	T	P	C
19212AEC12	Core-II Real Analysis	7	0	0	4

### 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:

Infiniteseriesand infiniteproducts

### UNIT III:

Sequences of functions

### UNIT IV:

Multivariable Differential Calculus

### UNIT V:

Implicit functions and Extremum problems

### Reference:

Mathematical Analysis Tom.M.Apostol.2<sup>nd</sup> 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.

## CoreIII-ORDINARYDIFFERENTIALEQUATIONS

Course Code	Course Title	L	T	P	C
19212AEC13	Core-III Ordinary Differential Equations	6	0	0	4

### Objectives:

1. Teaching the theory and application 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. Knowledge of Sturm-Liouville Problem.
3. Understanding about the stability of stationary solutions.

## CoreIV-PROGRAMMINGIN C++

CourseCode	CourseTitle	L	T	P	C
19220SEC14	Core –IV C++ Programming	6	0	0	4

### Objectives

- Utilize Object Oriented techniques to design C++ programs.
- Use the standard C++ library.
- Exploit advanced C++ techniques

### UNIT I:

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 students should be able to:

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to use 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-CLASSICALDYNAMICS

CourseCode	CourseTitle	L	T	P	C
19212DSC15 A	Elective-ClassicalDynamics	5	0	0	4

### Objectives.

1. Classicalmechanicsaffordthestudent anopportunityto mastermanyof mathematics techniques.
2. Itiscertainlytruethat classicalmechanicstodayisfar frombeingaclosed subject.
3. Alternativemeansexistinthecurriculumforacquiringthematematics needed in other branches.

### UNIT I:

IntroductoryConcepts—Chapter1(1.1—1.5)

### UNITII:

Lagrange'sequations— Chapter 2

### UNITIII:

SpecialapplicationsofLagrange'sequations— Chapter3

### UNITIV:

Hamiltonequations — Chapter4

### UNITV:

HamiltonJacobitheory—Chapter5

### Reference

CLASSICALDYNAMICS —DonaldT.Greenwood,PHI,India.

### LearningOutcomes:

Studentswhosuccessfullycompletethecoursewilldemonstratethefollowingoutcomes bytests, homework, and written reports:

1. Aknowledge ofmechanicalsystems,virtualworkEnergyandMomentum.
  2. UnderstandingtheconceptandApplicationsLagrange'sEquation.
  3. Aknowledge ofHamilton'sPrincipalfunction.
-

## ELECTIVE-FLUID DYNAMICS

Course Code	Course Title	L	T	P	C
19212DSC15B	Elective-Fluid Dynamics	5	0	0	4

### 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:

Fluid 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 by Shantyswarup, Krishnaprakashan 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. Knowledge of solving problems in viscous flow-steady viscous flow

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## SEMESTER– II

### CoreVCOMPLEXANALYSIS

CourseCode	CourseTitle	L	T	P	C
19212AEC21	Core–VComplex Analysis	5	1	0	3

#### 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 3<sup>rd</sup> 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. A knowledge of periodic functions, the weierstrass
  2. Research inquiry and analytical thinking abilities
  3. Abilities in conformal mapping
-



## Core V MEASURE THEORY AND INTEGRATION

Course Code	Course Title	L	T	P	C
19212AEC22	Core VI-Measure Theory and Integration	5	0	0	3

### 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

## Core VII-MATHEMATICAL METHODS

Course Code	Course Title	L	T	P	C
19212SEC23	Core VII-Mathematical Methods	6	0	0	3

### 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—Parseval's Theorem.

### UNIT IV

Linear Integral Equations—Definition, Regularity conditions—special kind of kernels — eigenvalues 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 and 4 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 integralequations and Method of successive approximations.
  3. Skillness in transformation from one function into another function
  4. Applications
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## CORE VIII-DIFFERENTIAL GEOMETRY

Course Code	Course Title	L	T	P	C
19212AEC24	Core VIII-Differential Geometry	5	0	0	3

### Objectives:

To provide an introduction to the differential geometry of curves and surfaces in space, both in its local and global aspects, with special emphasis on a geometric point of view, as a basis for further study or for applications (especially in physics, chemistry, civil and electrical engineering, graphics).

### UNIT I

**SPACE CURVES:** Definition of a space curve — Arc length — tangent — normal and binormal — curvature and torsion — contact between curves and surface — tangents surface — involutes and evolutes — Intrinsic equations — Fundamental Existence Theorem for space curves — Helices.

### UNIT II

**INTRINSIC PROPERTIES OF A SURFACE:** Definition of a surface — curves on a surface — Surface of revolution — Helicoids — Metric — Direction coefficients — families of curves — isometric correspondence — intrinsic properties.

### UNIT III

**GEODESICS:** Geodesics — Canonical. geodesic equations — Normal property of geodesics — Existence Theorems — Geodesic parallels — Geodesics curvature — Gauss-Bonnet Theorem — Gaussian curvature — surface of constant curvature.

### UNIT IV

**NONINTRINSIC PROPERTIES OF A SURFACE:** These second fundamental form — Principle curvature — Lines of curvature — Developable — Developable associated with space curves and with curves on surface — Minimal surfaces — Ruled surfaces.

### UNIT V

**DIFFERENTIAL GEOMETRY OF SURFACES:** Compact surfaces whose points are umbilics — Hilbert's lemma — Compact surface of constant curvature — Complete surface and their characterization — Hilbert's Theorem — Conjugate points on geodesics.

### Reference(s)

[1] T.J. Willmore, An introduction to Differential Geometry, Oxford University Press, (17th Impression) New Delhi 2002. (Indian Print).

UNIT — I	:	Chapter I : Sections 1 to 9.
UNIT — II	:	Chapter 11: Sections 1 to 9.
UNIT — III	:	Chapter 11: Sections 10 to 18.
UNIT — IV	:	Chapter 11 : Sections 1 to 8.
UNIT — V	:	Chapter IV Sections 1 to 8.

### Reference(s)

1. Struik, D.T. Lectures on Classical Differential Geometry. A. Dison—Wesley, Mass. 1950.
2. obayashi S. and Nornizu. K. Foundations of Differential Geometry, Interscience Publishers, 1963.
3. Wilhelm Klingenberg: A course in Differential Geometry, Graduate Texts in Mathematics, Springer Verlag, 1978.
4. J.A. Thrope Elementary topics in Differential Geometry, Under — graduate Texts in Mathematics, Springer — Verlag 1979.

**Learning Outcomes:**

Upon completion of the programme, student will be able:

1. To explain and apply the concepts and techniques of differential geometry of curves and surfaces.
  2. To analyze and solve problems (using concepts and techniques from differential geometry).
  3. A completed discussion of surfaces.
  4. Research inquiry and analytical thinking abilities.
-

## ELECTIVE-MATHEMATICAL PROBABILITY

CourseCode	CourseTitle	L	T	P	C
19212DSC25A	Elective-MathematicalProbability	5	0	0	4

### 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 of 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 to 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

## ELECTIVE-MATHEMATICALMODELLING

CourseCode	CourseTitle	L	T	P	C
19212DSC25B	Elective-MathematicalModelling	5	0	0	4

### 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

Modeling 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 JN Kapur Wiley Eastern Ltd New Delhi.
2. Theory of Ordinary Differential 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.

Multimedia Package Lab-II

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## RESEARCH METHODOLOGY

CourseCode	CourseTitle	L	T	P	C
19212RMC26	ResearchMethodology	3	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:

- To understand the approach 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.

**UNITIV: Thesis and Paperwriting:**

Conventions in writing – General format – Page and chapter format – Use of quotations and footnotes – Preparations of tables and figures – References – Appendices.

**UNITV: 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 William J. Palm III

**SEMESTER– III**  
**COREIX- TOPOLOGY**

CourseCode	CourseTitle	L	T	P	C
19212AEC31	CoreIX-Topology	6	0	0	5

**Objectives:**

- 1) The subject of topology is of interest in its own 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 SEPARATION 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 (2<sup>nd</sup> Edition) Pearson Education Pvt. Ltd., New Delhi—2002 (Third Indian Reprint)

- UNIT—I Chapter 2: Sections 12 to 17  
 UNIT — II Chapter 2: Sections 18 to 21 (Or omit 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. Simmons, 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. Seebach, Counterexamples 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 axioms.
-

**CORE-X-STOCHASTIC PROCESSES**

<b>CourseCode</b>	<b>CourseTitle</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19212SEC32	CoreX–StochasticProcess	6	1	0	5

**Objectives**

The objective of this course is to provide the fundamentals and advanced concepts of random processes to support graduate coursework and research in engineering. The required mathematical foundations will be studied at a 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 — Supermartingales 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 : Chapter 1 (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 : Chapter 6 (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” J. Medhi, Second Edition Wiley Eastern Ltd., New Delhi/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.

## CoreXI-ADVANCED NUMERICAL ANALYSIS

Subject Code	Title of the paper	L	T	P	C
19212AEC33	CoreXI-Advanced Numerical Analysis	6	1	0	5

### 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-Viet 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-Labatto integration method-Radau Integration Method and Gauss-Chebyshev 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.

### TEXTBOOK:

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

## Elective: CRYPTOGRAPHY

CourseCode	CourseTitle	L	T	P	C
19212DSC34A	Elective-Cryptography	5	0	0	4

**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:**

Knapsack pseudoprimes—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 algorithm 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.
-

## ELECTIVE: ALGEBRAIC CODING THEORY

Course Code	Course Title	L	T	P	C
19212DSC34B	Elective-Algebraic Coding Theory	5	0	0	4

### 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 Hadamard 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 — Solomon (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. Cambridge, Massachusetts, 1972.
4. E. R. Berlekamp. 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 signal on continuous channels.



## OPEN ELECTIVE

Course Code	Course Title	L	T	P	C
19220OEC	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 markup 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 webpage 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 frontend webpage and connect to the backend 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

## SEMESTER-IV

### CoreXII:FUNCTIONALANALYSIS

CourseCode	CourseTitle	L	T	P	C
19212AEC41	CoreXII-FunctionalAnalysis	5	1	0	5

#### Objectives:

- 1) TostudyaboutConverges,HilbertspacesandBessels's inequality.
- 2) TostudyaboutSpectralTheory.
- 3) Tostudyaboutconvergencesin $L(X,Y)$  –UniformboundednessandTheGelfand 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 : Thedefinition and some examples — Continuous linear transformations — The Hahn — Banachtheorem — The natural imbedding of  $N$  in  $N^{**}$  - The open mapping theorem — The conjugateof a operator.

#### UNIT II

HilbertSpaces:Thedefinitionandsomesimpleproperties—Orthogonalcomplements —Orthonormalsets—Theconjugatespace $H^*$ -Theadjointofanoperator—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

GeneralPreliminariesonBanachAlgebras:Thedefinitionandsomeexamples —Regularandsingularelements—Topologicaldivisorsofzero—Thespectrum—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 —TheGelfand-Neumark theorem.

#### Reference:

IntroductiontoTopologyandModernAnalysis, G.F.Simmons, McGraw-HillInternationalEd. 1963.

UNIT-I : Chapters8and9

UNIT-II : Chapter 10

UNIT-III : Chapter II

UNIT-IV : Chapter12

UNIT-V : Chapter13

#### Reference(s)

1. WalterRudin,FunctionalAnalysis,TMHEdition, 1974.
2. B.V.Limaye,FunctionalAnalysis,WileyEasternLimited,Print,1985.
3. K.Yosida,FunctionalAnalysis,Springer-Verlag,1974.
4. LaurentSchwartz,FunctionalAnalysis,CourantInstituteofmathematicalSciences,New York University, 1964.

#### LearningOutcomes

Uponsuccessfulcompletionofthiscourse,thestudent willbeableto:(Knowledgebased) distinguish among open and closed sets on different topological spaces;

- 1) knowthetwofundamentaltopologies:discreteandindiscretetopologies.
- 2) Identifypreciselywhenacollectionofsubsetsofagivenset equipped withatopology forms a topological space;
- 3) Understandwhentwotopologicalspacesare homeomorphic;

- 4) Identify the concepts of distance between two sets; connectedness, denseness, compactness and separation axioms.
  - 5) Research inquiry and analytical thinking abilities
-

## CoreXIII VISUALPROGRAMMING

CourseCode	CourseTitle	L	T	P	C
19212SEC42	CoreXIII–VisualProgramming	6	1	0	5

### Objectives

LearntodesignanddevelopWindows-basedbusinessapplicationsusingVisualBasic.NET programs that meet commercial programming standards.

- To learnthebasic principlesofvisualprogramming
- Tostudythenecessaryskillstocreatesoftwareolutionsusingvisualprogramming
- UnderstoodtheOpenDataBase Connectivityusing Visualprogramming.
- ToinculcateknowledgeonProgrammingandProjectDevelopmentusingVisualBasic.

### 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 — Datatypes — 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 — Scrollbars - Filesystem Controls( Drive, DirList, File List boxes)

### UNIT IV

Introduction to Built-in ActiveX Control — Toolbar — The Treeview control — The Listview control — The Image list control — Common Dialog Control — Statusbar 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 manipulated data — Open DataBase 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).
  - Implements 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 IDE enabled software solution to representative problems.
  - Students can use DDE data/ O component to read and write raster and vector data files.
  - Students can use OLE map component to develop a custom Windows Forms based application with a map and legend.
-

## COREXIV-NUMBERTHEORY

SubjectCode	Titleofthepaper	L	T	P	C
19212AEC43	CoreXIV -NUMBERTHEORY	6	0	0	5

### 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  $\sigma(n)$  – 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

## ELECTIVE-COMBINATORIAL.MATHEMATICS

CourseCode	CourseTitle	L	T	P	C
19212DSC44A	Elective-CombinatorialMathematics	5	0	0	4

### 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 combinatorial 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 permutation group.

### UNIT V

Polya's theorems and their immediate applications—Binary operations on permutation groups.

### Reference

Combinatoric 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, Mashfield, Massachusetts.

### 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.
-

## ELECTIVE-DESIGN AND ANALYSIS OF ALGORITHMS

Course Code	Course Title	L	T	P	C
19212DSC44B	Elective- Design And Analysis of algorithms	5	0	0	4

### Objectives:

1. Analyze the asymptotic performance of algorithms.
2. Write rigorous correctness proofs for algorithms.
3. Demonstrate 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

Divide— 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. Addison 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



## Open Elective - Writing for the Media

Course Code	Course Title	L	T	P	C
19211OEC	PG Open Elective - Writing for the Media	4	0	0	2

**Aim:**

- To equip students to enter into the realm of mass media.

**Objectives:**

- To help students 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,

## OPEN ELECTIVE – APPLICABLE MATHEMATICAL TECHNIQUES

Course Code	Course Title	L	T	P	C
19212OEC	Open Elective – <b>Applicable Mathematical Techniques</b>	4	0	0	2

### 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 get the knowledge about interpolation

CourseCode	CourseTitle	L	T	P	C
19215OEC	Open-elective-Bio-Analytical Techniques	5	0	0	3

### Aim

Bioanalysis is a sub-discipline of analytical chemistry covering the quantitative measurement of xenobiotics (drugs and their metabolites, and biological molecules in natural locations or concentrations) and biotics (macromolecules, proteins, DNA, large molecule drugs, metabolites) in biological

### 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)

1. The students learn various techniques and acquire the skills to use appropriate methods.
2. The students acquire the good laboratory practices.

### 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-Hasselbalch 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.

#### **UnitIV**

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.

#### **UnitV**

**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. BiophysicalChemistry–Nirmalendu nath**
- 2. BiophysicalChemistry–Upadhyay,Upadhyayandnath.**
- 3. Principlesand techniquesofpracticalBiochemistry–KeithWilsonand Walker.**
- 4. PrinciplesofInstrumentalanalysis–B.K.Sharma.**
- 5. Instrumentalanalysis–ChatwallAnand**

CourseCode	OPEN ELECTIVE PAPER	L	T	P	C
17213OEC	BIOMEDICAL INSTRUMENTATION	4	0	0	2

**Aim:**

- To understand the concepts and application of electronic instrumentation in the Medical field.

**Objective:**

The students will be able to

- Interpret technical aspects of medicine
- Solve Engineering Problems related to medical field
- Understand medical diagnosis and therapy

**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 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 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:**

- 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

**Books for Study**

1. R.SKhandpur, 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).

CourseCode	CourseTitle	L	T	P	C
19220OEC	OpenElective-InternetAndWebDesign	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 markup 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 webpage 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 frontend webpage and connect to the backend 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.

## Open Elective-Insurance Services

Course Code	Course Title	L	T	P	C
19261OEC35D	Open Elective-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.

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.

Out Come:

The course helped the students to learn the principles of Insurance and the functions of Life and general insurances and the IRDA.

Reference Books:

1. Dr.MR.Mishra –Law of Insurance–Central Law Agency Allahabad
2. Dr.M.M.Verma & R.K.Agarwal–Insurance
3. Pandey & Ratogi–Insurance
4. M.N.Mishra & S.Chand-Principles and Practice of Insurance



COURSECODE	COURSE TITLE	L	T	P	C
19214OEC	GreenChemistry	4	1	0	3

**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.

### 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 -BioCatalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentation Antibiotics – Vitamins- Bio catalysis synthesis of industrial chemicals by bacterial constructs-Future Trends.

### Unit IV -Green House Effect

Greenhouse effect and Global Warming–Introduction- How the greenhouse effect is produced - Major sources of green house gases - Emissions of CO<sub>2</sub> - Impact of green house effect on global climate- Control and remedial measures of greenhouse 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.Tinnes and
2. New Trends in Green Chemistry– V.K.Ahluwalia and M.Kidwai

## Open Elective–Counselling and Psychology

Course Code	Course Title	L	T	P	C
192800EC35E	PG Open Elective- Counselling and 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

## **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/M.A/M.Com/MBA/ ( ) curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSBCourses	Credits
I	ResearchLed Seminar	1
II	ResearchMethodology	3
II	ParticipationinBoundedResearch	2
III	DesignProject/SocioTechnicalProject ( Scaffolded Research)	4
IV	ProjectWork	12

#### Blueprintforassessmentofstudent'sperformanceinResearchLedSeminarCourse

● **InternalAssessment:** **40Marks**

- SeminarReport(UG)/ConceptNote(PG) : 5X4=20Marks
- SeminarReviewPresentation : 10Marks
- Literature Survey :10Marks

● **SemesterExamination** : **60**  
**Marks**

(EssaytypeQuestionssetbytheconcernedresourcepersons)

#### Blueprintforassessmentofstudent'sperformanceinSocioTechnicalProject

● **ContinuousInternalAssessmentthroughReviews:** **40 Marks**

● ReviewI	:	10Marks	
● ReviewII	:	10Marks	
● ReviewIII	:	20Marks	
● EvaluationofSocioTechnicalPracticumFinalReport:			<b>40Marks</b>
● Viva-VoceExamination:			<b>20 Marks</b>
● Total:			<b>100 Marks</b>

**Blueprint for assessment of student’s performance in Research Methodology Courses**  
**ContinuousInternalAssessment: 20Marks**

● ResearchTools(Lab):		10 Marks
● Tutorial:		10 Marks

**ModelPaperWriting: 40 Marks**

● Abstract:		5 Marks
● Introduction:		10 Marks
● Discussion:		10 Marks
● Review ofLiterature:		5 Marks
● Presentation:		10 Marks

<b>SemesterExamination:</b>		<b>40Marks</b>
<b>Total:</b>		<b>100 Marks</b>

\*\*\*\*\*



**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMILNADU

**M.Phil**

**SYLLABUS**

**(REGULATION 2019)**

**Department  
of  
Mathematics**

<b>1.1.3</b>	<b>Colour</b>
	Employability
	Skill Development



**DEPARTMENT OF MATHEMATICS COURSE**

**STRUCTURE**

**2019**

<b>SEMESTER-I</b>					
<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
193__11 (Common Paper)	Research Methodology	2	2	0	2
193MAC12	Algebra and Analysis	2	2	0	2
193MAC13	Advanced Numerical Analysis	2	2	0	2
(Common Paper) CPE_RPE	Research and Publication Ethics	2	2	0	2
	<b>Total</b>	<b>08</b>	<b>08</b>	<b>00</b>	<b>08</b>
<b>SEMESTER-II</b>					
193MAC31	Project Work				02

## MPhil-SYLLABUS

(For the candidates admitted from the academic year 2018-2019 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 subdivisions, 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.

#### **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**  
**193MAC12-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 advanced 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**

Vectorspaces – 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)

**BooksforStudy:**

1. Algebra by Thomas W Hungerford, Springer Verlag Indian reprint
2. Real and Complex Analysis by Walter Rudin, Tata McGraw Hill (II Edn) 1996.

**ReferenceBooks:**

Abstract Algebra by David S. Dummit and Richard M. Foote, 3<sup>rd</sup> Edition, Wiley Student Edition  
2. Linear Algebra by Stephen H. Friedberg, Arnold J. Insel, Lawrence E. Spence, Fourth Edition, Pearson

## Paper –III

### M.Phil Mathematics

#### 193MAC13-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-Viet method, Bairtow's method, Gracffe's root squaring method.

**Unit-II:** System of Algebraic Linear Equations - Direct methods – Gauss-Jordan Elimination Method – Triangularization method – Cholesky method – Partition method. Error Analysis – iterative methods: Jacobi iteration method – Gauss-Seidel 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 Deboor, Elementary Numerical Analysis, McGraw-Hill International Edn., 1983.

## RESEARCH AND PUBLICATION ETHICS

CourseCode	CourseTitle	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. Conflict 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**

### **UnitIV:OPENACCESSPUBLISHING(4hours.)**

1. Openaccesspublicationsandinitiatives.
2. SHERPA/RoMEOonlineresoursetocheckpublishercopyright&self-archivingpolicies.
3. SoftwaretooltoideitifypredatorypublicationsdevelopedbySPPU.
4. Journalfinder/journalsuggestiontoolsviz,JANE,ElsevierJournalFolder,SpringerJournal Suggester,etc.

### **UNITV:PUBLICATIONMISCONDUCT (4 hours)**

#### **A. GroupDiscussions(2hours)**

1. Subjectspecificethicalissues,FFP,authorship
2. Conflictsofinterest.
3. Complaintsandappeals:examplesandfraudfromIndiaandabroad.

#### **B. Softwaretools(2hours)**

UseofplagiarismsoftwarelikeTurnitin,Urkundandotheropensourcesoftwaretools.

### **UNITVI:DATABASESANDRESEARCHMETRICS(7hours)**

#### **A. Databases(4hours)**

1. Indexingdatabases.
2. Citationdatabase:WebofScience,Scopusetc.

#### **B. ResearchMetric(3hours)**

1. ImpactFactor ofjournalasper JournalCitationReport,SNIP,SJR,IPP,CiteScore.  
Metric: h-index. g index, i10 index, altmetrics.



**SCHOOL OF ARTS AND SCIENCE**

**DEPARTMENT OF COMPUTERSCIENCE**

**B.C.A - REGULATION 2019**

**COURSE STRUCTURE**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>SEMESTER I</b>					
19111AEC12	English-I	4	0	0	2
19122SEC13	Programming in C with C++	5	1	0	6
19122SEC14L	Programming in C with C++Lab	0	0	3	2
19112AEC15B	Classical algebra	5	0	0	4
19112AEC16B	Numerical and statistical methods	4	0	0	4
191__SEC01__	Skill Based Elective -I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>23</b>
<b>SEMESTER II</b>					
<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC22	English-II	4	0	0	2
19122SEC23	Data Structure and Algorithms	6	0	0	6
19122SEC24L	Data Structure and Algorithms Lab	0	0	3	2
19112AEC25B	Discrete Mathematics	5	0	0	4
19112AEC26B	Operations Research	4	0	0	4
19122RLC27	Research Led Seminar	-	-	-	1
191__SEC02__	Skill Based Elective-II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	2	1
	<b>Total</b>	<b>23</b>	<b>0</b>	<b>7</b>	<b>23</b>
<b>SEMESTER III</b>					
<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC32	English-III	4	0	0	2



19122SEC33	Internet and Java Programming	4	1	0	6
19122SEC34L	Internet and Java Programming Lab	0	0	3	2
19161SEC35	Financial Accounting	4	0	0	4
19113AEC36C	Allied Physics – I	3	0	0	4
19122RMC37	Research Methodology	3	0	0	3
191__SEC03__	Skill Based Elective –III	0	0	2	1
19111SEC03L	Communicative English Lab-III	0	0	2	1
	<b>Total</b>	<b>22</b>	<b>1</b>	<b>7</b>	<b>25</b>
	<b>SEMESTER IV</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC42	English-IV	4	0	0	2
19122SEC43	Visual Programming	6	0	0	6
19122SEC44L	Visual Programming Lab	0	0	3	4
19113AEC45C	Allied Physics -II	5	1	0	6
19113AEC46CL	Allied Physics Lab - I	0	0	3	2
191__SEC04__	Skill Based Elective-IV	0	0	2	1
19111SEC04L	Communicative English Lab-IV	0	0	1	1
	<b>Total</b>	<b>20</b>	<b>1</b>	<b>9</b>	<b>25</b>
	<b>SEMESTER V</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19122SEC51	Relational Database Management Systems	5	1	0	5
19122SEC52	.NET Programming	4	1	0	5
19122SEC53	Designing and supporting Computer Networks	4	0	0	5
19122SEC54L	Oracle Lab	0	0	3	2
19122SEC55L	.NET Programming Lab	0	0	3	2
19122DSC56_	Discipline Specific Elective –I	5	0	0	4
19122BRC57	Participation in Bounded Research	0	0	0	2
191__SEC05__	Skill Based Elective-V	0	0	2	1
19111SEC05L	Communicative English Lab-V	0	0	2	1
	<b>Total</b>	<b>18</b>	<b>2</b>	<b>10</b>	<b>27</b>
	<b>SEMESTER VI</b>				
<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19122SEC61	Advanced Web Technology	4	1	0	5
19122SEC62	Operating System	4	1	0	5
19122SEC63L	Advanced Web Technology Lab	0	0	3	2
19122SEC64L	Operating System Lab	0	0	3	2
19122DSC65_	Discipline Specific Elective –II	5	0	0	4
191__OEC	Open Elective Courses	4	0	0	2
19122PRW67	Project Work	0	0	0	4
191__SEC06__	Skill Based Elective –VI	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	2	1
19122EXACT	Extension Activities	0	0	0	1
19122PEE	Program Exit Examination	-	-	-	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>10</b>	<b>29</b>
	<b>Total Credits of the Programme</b>				<b>152</b>

### Discipline Specific Electives

Semester	Discipline Specific Elective Courses
V	a) 19122DSC56A- Computer Organization and Architecture b) 19122DSC56B - E-learning
VI	a) 19122DSC65A- Software Project Management b) 19122DSC65B - Object Oriented Analysis and Design

### Open Electives

Semester	Open Elective Courses
VI	a) 19110OEC-Tamil IlakkiyaVaralaru b) 19111OEC- Journalism c) 19112OEC-Development of Mathematical Skills d) 19113OEC-Instrumentation e) 19114OEC-Food and Adulteration f) 19116OEC-Wildlife Conservation g) 19120OEC-E-Learning h) 19161OEC-Banking Service

### Skill based Electives

Semester	Skill based Elective Courses
I	a) 19120SEC01A-Package Lab – I b) 19160SEC01B -Soft skill – I
II	a) 19120SEC02A -Package Lab – II b) 19160SEC02B -Soft skill – II
III	a) 19120SEC03A -Package Lab –III b) 19160SEC03B -Soft skill – III
IV	a) 19120SEC04A -Package Lab –IV b) 19160SEC04B -_Soft skill – IV
V	a) 19120SEC05A -Package Lab –V b) 19160SEC05B -Soft skill - V
VI	a) 19120SEC06A -Package Lab –VI b) 19160SEC06B -Soft skill – VI

### Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	12	10	-	-	-	1	23
II	12	10	-	-	1	-	23
III	8	14	-	-	3	-	25
IV	12	12	-	-	-	1	25
V	-	21	4	-	2	-	27
VI	-	16	4	2	4	2	29
<b>TOTAL</b>	<b>48</b>	<b>79</b>	<b>8</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>152</b>

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC11	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 [Employability]

**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 [Employability]

**UNIT – IV**

Editing

Proof reading [Employability]

**UNIT – V**

Comparison and contrast

Cause and effect [Employability]

**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
19111AEC12	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
19122SEC13	Programming in C with C++	5	1	0	6

**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.

### 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
19122SEC14L	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 code	Course Title	L	T	P	C
19112AEC15B	Classical Algebra	5	0	0	4

### 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  $r^{\text{th}}$  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  $r^{\text{th}}$  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

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&amp;2.

Course code	Course Title	L	T	P	C
19112AEC16B	Numerical And Statistical Methods	4	0	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 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 –Range 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.

**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.

**Skill Based Elective -I**

Course Code	Course Title	L	T	P	C
19122SEC01AL	Packages Lab -I	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	Course Title	L	T	P	C
19111SEC01L	Communicative English Lab-I	0	0	1	1

**AIM:**

- To acquaint with the basic grammar and develop language skills

**OBJECTIVE:**

- To know English grammar and all the concomitant linguistic items
- To learn about the auxiliary and the models
- To understand the types of sentences and its patterns
- To enrich vocabulary
- To know the features, process, forms and barriers of communication
- To enhance listening skill

**OUTCOME:**

- Understand grammar
- Develop listening skill

**UNIT –I**

Parts of speech

**UNIT – II**

Kinds of Sentences, Patterns of sentences

**UNIT – III**

Auxiliaries, Modals

**UNIT –IV**

Communication-Characteristics-Process-Forms-Barriers-Types

**UNIT-V**

Listening-benefits-types-good listener-active and passive listening-Tips for effective listening

**Lab Note-1.** Word Mentor - Level I Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, Listening activity from Globarena Software

2. Vocabulary diary

**Viva-**Listening activity**Exam components**-Theory-50+MCQ online exam-vocabulary-20+Viva-15+Lab note-15=100**REFERENCES:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

Course Code	Course Title	L	T	P	C
191INDCONS	Indian Constitution	1	0	0	1

**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.

**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
19111AEC21	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
19111AEC22	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 [Employability]

The First Meeting

-Sujata Bhatt

**UNIT –II**

Fueled

-Marcie Hans [Employability]

Asleep

-Ernst Jandl

Buying and selling

-Khalil Gibran [Employability]

**UNIT –III**

The End of living and The Beginning of Survival	- Chief Seattle
My Wood	- E.M.Forster
The Meeting of Races	- Rabindranath Tagore [Employability]
<b>UNIT – IV</b>	
The Refugee	-K.A. Abbas
I Have a Dream	-Martin Luther king
Those People Next Door	-A.G. Gardiner [Employability]
<b>UNIT – V</b>	
Marriage is a private Affair	-Chinua Achebe
The Fortune Teller	-Karel Capek
Proposal	-Anton Chekov [Employability]
<b>REFERENCES:-</b>	
Gathered Wisdom	-GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
19122SEC23	Data Structure and Algorithms	6	0	0	6

### 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. [Employability]

### 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. [Employability]

### 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 [Employability]

### 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. [Employability]

### 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
19122SEC24L	Data Structure and Algorithms Lab	0	0	3	2

## 1. SORTING:

- a. Bubble sort [Employability]
- b. Heap sort [Employability]
- c. Insertion Sort [Employability]

## 2. SEARCHING:

- a. Linear search [Employability]
  - b. Binary search [Employability]
3. Operations on Stack [Employability]
  4. Operations on Queue [Employability]
  5. Operations on single Linked list [Employability]
  6. Operations on doubly linked list [Employability]
  7. Binary Tree Traversal [Employability]

Course code	Course Title	L	T	P	C
19112AEC25B	Discrete Mathematics	5	0	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. [Employability] 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 [Employability]

**UNIT-II**

cosets & lagrange’s thm-Normal groups and quotient groups- Different types of morphisms of groups fundamental thm of homomorphism. [Employability]

**UNIT III**

Graph theory - Basic concepts- Finite and infinite graph – Incidence and degree ideas on vertices- Isomorphism-sub graphs – Walks – Paths and circuits [Employability]

**UNIT IV**

Connected Graphs And Disconnected Graphs And Components - Euler Graphs – Hamiltonian Path And Circuits [Employability]

**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
19112AEC26B	Operations Research	4	0	0	4

**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 humiliate 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. [Employability]

**UNIT — II**

Algibric Solution: Simplex methods — Charnes method of penalty - Two phase simplex method. [Employability]

**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 **Employability]**

**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 **Employability]**

**.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 gets the knowledge about inventory theory

**REFERENCE BOOKS:**

1. Hamdy A. Taha: Operation Research - An Introduction 5<sup>th</sup> Edition, PHI, New Delhi 1996
2. Ackoff, R Land Sasieni, M.N: Fundamental of Operation research, John Wiley and sons, New york 1968.

**Skill Based Elective-II**

Course Code	Course Title	L	T	P	C
19122SEC02AL	Packages Lab-II	0	0	2	1

**MS –EXCEL**

1. Prepare the addressing methods in excel **Employability]**
2. Prepare an Excel Document using different type of Functions. **Employability]**
3. Draw a Graph by using your own data **Employability]**
4. Prepare an Individual Pay Bill preparation for an employee in an organization. **Employability]**
5. Prepare a Mark List for the Students. **Employability]**
6. Prepare a Worksheet for a Company. **Employability]**
7. Prepare an Inventory Report for a Shop. **Employability]**
8. Prepare an Electricity Bill for the Domestic Customers **Employability]**



Course Code	Course Title	L	T	P	C
19111SEC02L	Communicative English Lab-II	0	0	2	1

**AIM:**

To acquaint with the basic grammar and develop language skills

**OBJECTIVE:**

- To understand the different tenses and use it in sentences
- To form sentences
- To know subject verb agreement
- To enrich vocabulary
- To read and comprehend the context

**OUTCOME:**

- Understand grammar
- Develop reading skills

**UNIT-1**

Tenses-Simple, Perfect **Employability]**

**UNIT -II**

Tenses-Continuous, Perfect continuous **Employability]**

**UNIT -III**

Forming sentences-positive, negative and questions **Employability]**

**UNIT -IV**

Concord **Employability]**

**UNIT -V**

Reading-benefits-purpose-techniques-types-tips for effective reading **Employability]**

**Lab Note-1.** Word Mentor - Level II Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, reading activity from Globarena Software 2. Newspaper Article notebook

**Viva-Reading activity**

**Exam Components**-Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**REFERENCES:-**

- |                                      |   |
|--------------------------------------|---|
| English Grammar                      | -Wren and Martin                                  |
| English Grammar and Composition      | -Radhakrishna Pillai                              |
| Technical Communication              | -Meenakshi Sharma & Sangeetha Sharma              |
| Essentials of Business Communication | -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons |

	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC31	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

**Employability]**

**UNIT –II**

Consonants, Consonant cluster **Employability]**

**UNIT – III**

Syllable, Word accent, Intonation **Employability]**

**UNIT – IV**

Idiom, Interpretation of graphics **Employability]**

**UNIT – V**

Slogan writing, writing advertisement **Employability]**

**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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC32	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 **Employability]**  
 The Postmaster - Rabindranath Tagore **Employability]**  
 Princess September - E.Somerest Maugham **Employability]**

**UNIT – II**

The Price of Flowers

-Prabhat Kumar Mukhopadhyay

The Open Window -Saki  
 The Model Millionaire -Oscar Wilde [Employability]  
**UNIT –III**  
 My Brother My Brother -Norah Burke  
 Uneasy Home Coming - Will F. Jenkins  
 Resignation -Premchand [Employability]  
**UNIT –IV**  
 The Referee -W.H. Andrews & Geoffrey Dreamer  
 The Case of the Stolen Diamonds -Farrell Mitchell [Employability]  
**UNIT – V**  
 The Dear Departed -Stanley Houghton  
 The Princess and the Wood Cutter -Alan Alexander Milne [Employability]  
**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
19122SEC33	Internet and Java Programming	4	1	0	6

**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  
 [Employability]

**UNIT-II**

Decision making and looping statements -Classes, Objects and Methods  
 [Employability]

**UNIT-III**

Arrays, strings and vectors- Interfaces: Multiple Inheritance – Packages: Putting classes together - Multithreaded Programming [Employability]

**UNIT-IV**

Files and Exception Handling: Exception – File Handling. [Employability]

**UNIT-V**

Applet, AWT and Swing: Applet programming – AWT Event Handling – Swing.  
 [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
19122SEC34L	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.

Course Code	Course Title	L	T	P	C
19161SEC35	Financial Accounting	4	0	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. [Entrepreneurship]

**UNIT – II**

Subsidiary books – Advantages Subsidiary books - Purchases Book, Sales Book, Purchases returns Book, Sales returns Book, - Cash Book. [Entrepreneurship]

**UNIT – III**

Trial balance – Preparation - Rectification of errors –Bank Reconciliation Statement. [Entrepreneurship]

**UNIT – IV**

Final Accounts – Trading Accounts - Profit and Loss Accounts - Balance Sheet. [Entrepreneurship]

**UNIT – V**

Bills of Exchange – Single Entry System – Simple Problems. [Entrepreneurship]

**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
19113AEC36C	Electricity and Electronics	3	0	0	4

**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). **[Employability]**

**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. **[Employability]**

**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. **[Employability]**

**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. **[Employability]**

**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 Magnetism by Brijlal and Subramaniam.
- 2) Principles of electronics by V.K. Metha.

Course Code	Course Title	L	T	P	C
19122RMC37	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-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.

**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. **[Employability]**

**UNIT-II Research Methods**

Research methods versus Methodology – Research and scientific method – criteria of good research – Problems encountered by researchers in India. **[Employability]**

**UNIT-III Literature Survey**

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Review – General treatises – Monographs. **[Employability]**

**UNIT-IV Database Survey**

Database search – NIST –MSDS –PubMed – Scopus – Science citation index – Information about a specific search. **[Employability]**



**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. [Employabilit]**

**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.

**Skill Based Elective –III**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19122SEC03AL	Packages Lab -III	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	Course Title	L	T	P	C
19111SEC03L	Communicative English Lab-III	0	0	2	1

**AIM:**

To acquaint with the basic grammar and develop language skills

**OBJECTIVE:**

- To change a sentence from active to passive and vice versa
- To make sentences
- To write a letter
- To improve vocabulary
- To enhance speaking skills
- To enrich writing skills

**OUTCOME:**

- Understand grammar
- Develop speaking and writing skills

**UNIT –1**

Active and Passive [Employability]

**UNIT –II**

Developing the hints [Employability]

**UNIT –III**

Letter writing [Employability]

**UNIT –IV**

Speaking-benefits-features of a good speaker-Tip for improving speech-types [Employability]

**UNIT –V**

Writing-benefits-types-tips for improving writing [Employability]  
[Employability]

**Lab Note-1.** Anagrams, Word Traps, Stinging Words, letter writing from Globarena Software, Self-introduction, 2. Picture writing note book

**Viva-**Self introduction, Picture talk

**Exam components-**Theory -50+MCQ online exam -20+Viva-15+Lab note-10=100

**REFERENCES:-**

English Grammar -Wren and Martin  
English Grammar and Composition -Radhakrishna Pillai  
Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

COURSE CODE	COURSE TITLE	L	T	P	C
19111AEC41	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. [Employability]

**UNIT – II**

Flowchart

Proposals [Employability]

**UNIT – III**

Discourse markers

Review [Employability]

**UNIT IV**

Grammatical forms

Paraphrasing [Employability]

**UNIT –V**

Definition

Writing for and against a topic. [Employability]

**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
19111AEC42	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 [Employability]

**UNIT –II**

My Last Duchess -Robert Browning  
 The Toys -Coventry Patmore  
 I, too -Langston Hughes [Employability]

**UNIT –III**

The Best Investment I ever made-A.J.Cronin  
 The Verger -W.S Maugham  
 A Willing Slave -R.K.Narayan [Employability]

**UNIT –IV**

Macbeth  
 As You Like It [Employability]

**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
19122SEC43	Visual Programming	6	0	0	6

**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. **[Employability]**

## 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. **[Employability]**

## 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. **[Employability]**

## UNIT IV

VB Objects - Dialog Boxes - Common Controls - Menus - MDI Forms - Testing, Debugging and Optimization - Working with Graphics. **[Employability]**

## UNIT V

Monitoring Mouse activity .- File Handling - File System Controls - File System Objects - COM/OLE - automation - DLL Servers - OLE Drag and Drop. **[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)
- 3.

Course Code	Course Title	L	T	P	C
19122SEC44L	Visual Programming Lab	0	0	3	4

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 Code	Course Title	L	T	P	C
19113AEC45C	Allied Physics-II	5	1	0	6

### 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. **[Employability]**

#### UNIT – II: BOOLEAN ALGEBRA:

Basic logic gates – Universal gates – Fundamental concepts of Boolean algebra – De Morgan's theorem: Simplification of expressions – Karnaugh map. **[Employability]**

#### 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. **[Employability]**

**UNIT – IV: MEMORY ELEMENTS:**

RAM – types – ROM: ROM, PROM, EPROM, EEPROM – Magnetic tape – Magnetic disc – Bubble memory. [Employability]

**UNIT – V: REGISTERS AND COUNTERS:**

Registers: Shift register – Left shift register – Right shift register – Counters: Ripple counter – Mode N counter – up counter – down counter. [Employability]

**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
19113AEC46CL	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 Demorgan's theorem..
- 8) Half adder and Half subtractor.
- 9) Logic Gates-Universality of NAND Gate.
- 10) OP AMP Differentiator ,Intergrator.



### Skill Based Elective-IV

Course Code	Course Title	L	T	P	C
19122SEC04AL	Packages Lab-IV	0	0	2	1

### 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	Course Title	L	T	P	C
19111SEC04L	Communicative English Lab-IV	0	0	1	1

#### AIM:

To develop communicative skills

#### OBJECTIVE:

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To develop presentation skill
- To enrich vocabulary

#### OUTCOME:

- Understand grammar
- Develop language and presentation skills

**UNIT –I**Direct and Indirect **[Employability]****UNIT –II**Comprehension **[Employability]****UNIT –III**Conversation **[Employability]****UNIT –IV**Descriptive Writing **[Employability]****UNIT –V**Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception **[Employability]****Lab Note-** Confusing Words, Word families, Non-English words, Presentation skills, Oral presentation, Conversation from Globarena software**Viva-**Presenting a topic**Exam components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100**REFERENCES:-**

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons
Soft skills	-D.Jayacandran D.J Publishers

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

**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.

#### REFERENCE BOOK:

1. “ENVIRONMENTAL STUDIES”, K.Kumarasamy, A.Alagappa Moses, M.Vasanthi.

Course Code	Course Title	L	T	P	C
19122SEC51	Relational Database Management Systems	5	1	0	5

#### 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. **[Employability]**

#### UNIT -II

An Introduction to Relational Databases- Introduction - Relational Model - Relations and Relvars - Optimization - Transactions - An Introduction to SQL - Embedded SQL - Domains , Relations , Relvars. **[Employability]**

#### UNIT- III

Relational Algebra - Introduction - Syntax - Semantics - Examples - Additional Operators - Relational Calculus - Introduction - Tuple Calculus - Examples - Calculus Vs Algebra - Domain Calculus - SQL Specialties . **[Employability]**

#### UNIT -IV

Relational Model & SQL – RDBMS Terminology, CODD's rule for RDBMS, Concept of Relational Model, and SQL: SQL Database creation & manipulation views & queries on RDBMS **[Employability]**

#### UNIT- V

Database Recovery & Backup, Performance & Security - Introduction to database Recovery, Concurrency Control Techniques, Locking mechanism, Dead Locks, Techniques

of backup, RAID configuration, database Security techniques and storage technique- DAS, NAS, SAS. [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
19122SEC52	.NET Programming	4	1	0	5

### 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  
[Employability]

### UNIT II

Visual Basic .NET operators-software Design, conditional structures, and controls  
Flow-Methods. [Employability]

### UNIT III

Interfacing with the End user-ASP.NET Applications. [Employability]

### UNIT IV

Web Form Fundamentals – Web Controls – Validation and Rich Controls.  
[Employability]

### 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
19122SEC53	Designing and supporting Computer Networks	4	0	0	5

**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 **[Employability]**

**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 **[Employability]**

**UNIT III**

Configuring a Router Using IOS CLI – Connecting the CPE to the ISP – Routing: Enabling Routing Protocols – Exterior Routing Protocols **[Employability]**

**UNIT IV**

Network Layer: Routing algorithms: The optimality Principle – Shortest path routing – Routing for mobile hosts – Congestion Control Algorithms. **[Employability]**

**UNIT V**

Transport Layer: The Transport 57 Service –Services Provided to the Upper Layers. TCP: Introduction to TCP – The TCP Service Model – The TCP Protocol – TCP Connection Establishment and Connection Release. Application Layer: DNS – The Domain Name System **[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
19122SEC54L	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**.

Course Code	Course Title	L	T	P	C
19122SEC55L	.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.

#### Discipline Specific Elective-I

Course Code	Course Title	L	T	P	C
19122DSC56A	Computer Organization and Architecture	5	0	0	4

#### 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. **[Employability]**

## UNIT II

Digital components: Integrated circuits – Decoders - Multiplexers - Registers - Shift Registers - Binary Counters - Memory unit. [Employability]

## UNIT III

Data Representation: Data types - Complements – Fixed point representation – Floating Point representation – Other binary codes – Error detection codes. [Employability]

## UNIT IV

**Central processing unit: General Register organization – Stack organization – Instruction formats – Addressing modes – Data transfer and manipulation – Program control – Reduced instruction set computers. [Employability]**

## UNIT V

Memory Organization: Memory hierarchy – Main memory – Auxiliary memory – Associative Memory – Cache Memory – Virtual Memory – Memory Management and Hardware. [Employability]

### 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

#### Skill Based Elective-V

Course Code	Course Title	L	T	P	C
19122SEC05AL	Packages lab-V	0	0	2	1

## 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	Course Title	L	T	P	C
19111SEC05L	Communicative English Lab-V	0	0	2	1

**AIM:**

To develop communicative skills

**OBJECTIVE:**

- To understand the degrees of comparison
- To build up a thought
- To write resume
- To construct report, agenda and minutes
- To prepare for an interview

**OUTCOME:**

- Develop communicative skills
- To get a job

**UNIT –I**

Degrees of comparison [Employability]

**UNIT –II**

Proverb expansion [Employability]

**UNIT –III**

Resume writing [Employability]

**UNIT –IV**

Interview [Employability]

**UNIT –V**

Corporate skills-body language-etiquette-good manners-interpersonal skills

[Employability]

**Lab Note-** Report writing, Resume writing, Interview from Globarena software, Writing agenda, Writing minutes

**Viva-Mock Interview**

**Exam components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100



**REFERENCES:-**

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons
Soft skills	-D.Jayacandran D.J Publishers

**SEMESTER – VI**

Course Code	Course Title	L	T	P	C
19122SEC61	Advanced Web Technology	4	1	0	5

**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. **[Employability]**

**UNIT-II**

DHTML and Style Sheet – Frames-Forms. **[Employability]**

**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. **[Employability]**

**UNIT-IV**

XML: Introduction – What is XML – XML Document Structure – PHP and XML – XML Parser – The XML DOM – Simple XML – Changing a value with SimpleXML **[Employability]**

**UNIT-V**

Web Services -. Introduction - Web Services Concept - WSDL - What is UDDI? –

Introduction to -SOAP XML-RPC - Introducing XML-RPC - Creating Web services Calling Web Services - 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
19122SEC62	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. **[Employability]**

**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. **[Employability]**

**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. **[Employability]**

**UNIT- IV**

Virtual Memory: Demand Paging - Page Replacement - Page Replacement Algorithms - Thrashing. File System: File Concepts - Access Methods - Directory Structures

- Protection Consistency Semantics - File System Structures - Allocation Methods - Free Space Management. **[Employability]**

**UNIT V :**

I/O System: Overview - I/O Hardware - Application I/O Interface - Kernel I/O Subsystem-Transforming I/O Requests to Hardware Operations - Performance. Secondary Storage Structures: Protection - Goals - Domain - Access matrix - The Security Problem – Authentication - Threats - Threat Monitoring - Encryption. **[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
19122SEC63L	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.

Course Code	Course Title	L	T	P	C
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19122SEC64L	Operating System 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.
  - 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.

### Discipline specific Elective-II

Course Code	Course Title	L	T	P	C
19122DSC56B	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. **[Employability]**

### 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 **[Employability]**

### 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. [Employability]

### UNIT-IV

Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and concept of Hierarchy Generation, Task relevant Data, Background Knowledge, Presentation and Visualization of Discovered Patterns [Employability]

### UNIT-V

Association Rule Mining, Classification and Prediction – Decision Tree, Bayesian Classification Back Propagation, Cluster Analysis, Outlier Analysis [Employability]

### 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.

Course Code	Course Title	L	T	P	C
19122DSC65A	Software Engineering	5	0	0	4

### AIM:

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.

[Employability]

### 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. [Employability]

### 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. **[Employability]**

#### UNIT IV

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. **[Employability]**

#### UNIT V

Introduction – Understanding Behavior – Organizational Behavior: 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]**

#### OUTCOMES:

- 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.

Course Code	Course Title	L	T	P	C
19122DSC65B	Object oriented analysis and design	5	0	0	4

#### 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. **[Employability]**

#### 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.  
[Employability]

### 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. [Employability]

### Unit IV

User interface design – View Layer Classes – Micro level processes – View Layer interface - Case Studies. [Employability]

### Unit V

Object orientation on testing – Test cases – Test plans – Continuous testing – Debugging principles – System usability – Measuring user satisfaction – Case studies [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.

FREE ELECTIVE					
COURSE CODE	COURSE TITLE	L	T	P	C
19111OEC	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 [Employability]

### UNIT- II

News – Definition – Kinds – Elements – Sources [Employability]

**UNIT- III**

Reporters [Employability]

**UNIT- IV**

The Editor and the Sub Editor [Employability]

**UNIT –V**

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

[Employability]

**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 &amp; Journalism - D.S Mehta

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112OEC	<b>Development Of Mathematical Skills</b>	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
19113OEC	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.

**[Employability]**

**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) **[Employability]**

**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).  
[Employability]

#### Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.  
[Employability]

#### 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. [Employability]

#### 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 – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	COURSE TITLE	L	T	P	C
19114OEC	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. [Employability]

#### Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids. [Employability]

### Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration. [Employability]

### 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. [Employability]

### 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. [Employability]

### 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
19120OEC	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. [Employability]

### 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. [Employability]

### **UNIT III APPLICATIONS**

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site. **[Employability]**

### **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. **[Employability]**

### **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.

**Skill Based Elective –VI**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17122SEC06AL	Packages Lab –VI	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 Movie Clip and Graphic Symbols.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111SEC06L	Communicative English Lab-VI	0	0	2	1

**AIM:**

To develop communicative skills

**OBJECTIVE:**

- To write simple, compound and complex sentences
- To extract the main ideas from a text
- To shorten a text
- To enhance writing skills

- To learn to manage time and stress
- To widen creative thinking
- To enrich the skill of working in a group

**OUTCOME:**

- Develop communicative skills
- To be a good team worker

**UNIT –I**

Simple, Compound and Complex [Employability]

**UNIT –II**

Note making [Employability]

**UNIT –III**

Precise writing [Employability]

**UNIT –IV**

Developing a story [Employability]

**UNIT –V**

Essay writing [Employability]

**Lab Note**-Creative thinking, Time management, Stress management, Assertiveness, Group discussion from Globarena Software

**Viva**-Group discussion

**Exam components**-Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**REFERENCES:-**

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons

Course Code	Course Title	L	T	P	C
19122PRW67	Project Work	0	0	0	4

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 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	3
V	Participation in Bounded Research	2
VI	Project Work	4

## Blueprint for assessment of student's performance in Research Led Seminar Course

● <b>Internal Assessment:</b>	<b>40 Marks</b>
● Seminar Report (UG)/Concept Note(PG)	: 5 X 4= 20 Marks
● Seminar Review Presentation	: 10 Marks
● Literature Survey	: 10 Marks
● <b>Semester Examination</b>	<b>60</b>
<b>Marks</b>	

(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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THANJAVUR – 613 403 - TAMIL NADU

**SCHOOL OF ARTS & SCIENCE  
DEPARTMENT OF COMPUTER SCIENCE**

**BACHELOR OF COMPUTER SCIENCE  
(B.Sc.,C.S.)  
CURRICULUM**

**REGULATION 2019**



**PRIST**  
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**UNIVERSITY**  
NAAC ACCREDITED

**SCHOOL OF ARTS & SCIENCE**  
**Department of Computer Science**

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Department	:	COMPUTER SCIENCE
Programme	:	B.Sc (Computer Science)

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**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**

<b>Programme Outcome-PO</b> <b>Programme Educational Objectives-PEO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>PEO1</b>		✓			✓	
<b>PEO2</b>	✓					
<b>PEO3</b>			✓			✓
<b>PEO4</b>						✓
<b>PEO5</b>			✓		✓	

## B.Sc C.S. Curriculum Mapping

### Programme Outcome-PO VS Course Outcome-CO

<b>Programme Outcome-PO Course Outcome-CO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>CO1</b>	✓					
<b>CO2</b>	✓		✓			
<b>CO3</b>	✓		✓		✓	
<b>CO4</b>			✓			✓
<b>CO5</b>		✓				
<b>CO6</b>				✓		✓
<b>CO7</b>						✓
<b>CO8</b>			✓			✓
<b>CO9</b>					✓	✓



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**SCHOOL OF ARTS & SCIENCE**  
**Department of Computer Science**  
**B.Sc., COMPUTER SCIENCE**

(For the candidates admitted from the academic year 2019-2020 onwards)

**COURSE STRUCTURE**

**SEMESTER – I**

Course Code	Course Title	L	T	P	C
19110AEC11/ 19132AEC11/ 19111AEC11/ 19135AEC11	Tami – I/Hindi-I/Advanced English-I/French – I	4	0	0	2
19111AEC12	English-I	4	0	0	2
19120SEC13	Programming in C with C++	5	1	0	6
19120SEC14L	Programming in C with C++ Lab	0	0	3	2
19112AEC15B	Classical algebra	5	0	0	4
19112AEC16B	Numerical and statistical Methods	4	0	0	4
191__SEC01__	Skill Based Elective –I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	1	0	0	1
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>23</b>

**SEMESTER – II**

Course Code	Course Title	L	T	P	C
19110AEC21/ 19132AEC21/ 19111AEC21/ 19135AEC21	Tamil – II/Hindi-II/Advanced English-II/French – II	4	0	0	2
19111AEC22	English-II	4	0	0	2
19120SEC23	Internet and Java Programming	5	1	0	6
19120SEC24L	Internet and Java Programming Lab	0	0	3	2
19112AEC25B	Discrete Mathematics	5	0	0	4
19112AEC26B	Operations Research	4	0	0	4
19120RLC27	Research Led Seminar	-	-	-	1
191__SEC02__	Skill based Elective –II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	2	1

	<b>Total</b>	<b>22</b>	<b>1</b>	<b>7</b>	<b>23</b>
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### SEMESTER – III

Course Code	Course Title	L	T	P	C
19111AEC32	English-III	4	0	0	2
19120SEC33	Visual Programming	5	0	0	6
19120SEC34L	Visual Programming Lab	0	0	3	2
19113AEC35A	Applied physics –I	4	0	0	6
19113AEC36AL	Applied physics Lab – I	0	0	3	2
19120RMC37	Research Methodology	3	0	0	3
191__SEC03__	Skill based Elective –III	0	0	2	1
19111SEC03L	Communicative English Lab-III	0	0	2	1
	<b>Total</b>	<b>20</b>	<b>0</b>	<b>10</b>	<b>25</b>

### SEMESTER – IV

Course Code	Course Title	L	T	P	C
19111AEC42	English-IV	4	0	0	2
19120SEC43	Active Server Programming	5	1	0	6
19120SEC44L	Active Server Programming Lab	0	0	3	4
19113AEC45A	Applied physics –II	6	0	0	6
19113AEC46AL	Applied physics Lab –II	0	0	3	2
191__SEC04__	Skill based Elective –IV	0	0	2	1
19111SEC04L	Communicative English Lab-IV	0	0	1	1
191ENVTSTU	Environmental Studies	1	0	0	1
	<b>Total</b>	<b>20</b>	<b>1</b>	<b>9</b>	<b>25</b>

### SEMESTER – V

Course Code	Course Title	L	T	P	C
19120SEC51	Data Communication and Networking	5	0	0	5
19120SEC52	Operating System	4	1	0	5
19120SEC53	Microprocessor and its Applications	4	1	0	5
19120SEC54L	Microprocessor Lab	0	0	3	2
19120SEC55L	Operating System Lab	0	0	3	2
19120DSC56_	Discipline Specific Elective -I	5	0	0	4
19120BRC57	Participation in Bounded Research	-	-	-	2
191__SEC05__	Skill Based Elective –V	0	0	2	1

19111SEC05L	Communicative English Lab-V	0	0	2	1
<b>Total</b>		<b>18</b>	<b>2</b>	<b>10</b>	<b>27</b>

### SEMESTER – VI

Course Code	Course Title	L	T	P	C
19120SEC61	.NET Programming	4	1	0	5
19120SEC62	Relational Data Base Management System	4	1	0	5
19120SEC63L	.NET Programming Lab	0	0	3	2
19120SEC64L	Oracle Lab	0	0	3	2
19120DSC65_	Discipline Specific Elective –II	5	0	0	4
191__OEC	Open Elective	4	0	0	2
19120PRW67	Project Work	-	-	-	4
191__SEC06__	Skill Based Elective –VI	0	0	2	1
19111SEC06L	Communicative English – VI	0	0	2	1
19120EXACT	Extension Activities	0	0	0	1
19120PEE	Program Exit Examination	-	-	-	2
<b>Total</b>		<b>17</b>	<b>2</b>	<b>10</b>	<b>29</b>
<b>Total Credits of the Programme</b>					<b>152</b>

### DISCIPLINE SPECIFIC ELECTIVE COURSES:

Semester	Elective	Course Code	Course Title
<b>V</b>	<b>I</b>	19120DSC56A (Or) 19120DSC56B	Cloud Computing (Or) Software Engineering
		19120DSC65A (Or) 19120DSC65B	Data Mining (Or) Artificial Intelligence and Expert System

### OPEN ELECTIVE COURSES:

Semester	General Elective	Course Code	Course Title
<b>VI</b>	A	19111OEC	Journalism
	B	19112OEC	Development of Mathematical Skills
	C	19113OEC	Instrumentation
	D	19114OEC	Food and Adulteration



	E	19117OEC	Mushroom Technology
	F	19161OEC	Indirect Tax

**SKILL BASED ELECTIVE COURSES:**

Semester	Skill Based Elective	Course Code	Course Title
I	I	19120SEC01AL/ 19160SEC01B	Packages Lab-I / Soft Skill-I
II	II	19120SEC02AL/ 19160SEC02B	Packages Lab-II / Soft Skill-II
III	III	19120SEC03AL/ 19160SEC03B	Packages Lab-III / Soft Skill-III
IV	IV	19120SEC04AL/ 19160SEC04B	Packages Lab-IV / Soft Skill-IV
V	V	19120SEC05AL/ 19160SEC05B	Packages Lab-V / Soft Skill-V
VI	VI	19120SEC06AL/ 19160SEC06B	Packages Lab-VI / Soft Skill-VI

**CREDIT DISTRIBUTION**

SEMESTER	AEC	SEC	DSC	OEC	RESEARCH	OTHERS EVS&IC	EXTACT	TOTAL
<b>I</b>	12	10	-	-	-	1	-	<b>23</b>
<b>II</b>	12	10	-	-	1	-	-	<b>23</b>
<b>III</b>	12	10	-	-	3	-	-	<b>25</b>
<b>IV</b>	12	12	-	-	-	1	-	<b>25</b>
<b>V</b>	-	21	4	-	2	-	-	<b>27</b>
<b>VI</b>	-	16	4	2	4	2	1	<b>29</b>
<b>TOTAL</b>	<b>48</b>	<b>79</b>	<b>8</b>	<b>2</b>	<b>10</b>	<b>4</b>	<b>1</b>	<b>152</b>

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC11	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
19111AEC12	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

**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
19120SEC13	Programming in C with C++	5	1	0	6

**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 [Employability]

: 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 [Employability]  
– Friend and Virtual Functions -Constructors and Destructors [Employability]  
- Operator overloading.

### UNIT-V

#### Inheritance and its Types- Files [Employability]

- 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.

### 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
19120SEC14L	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 code	Course Title	L	T	P	C
19112AEC15B	Classical Algebra	5	0	0	4

### 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  $r^{\text{th}}$  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  $r^{\text{th}}$  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**

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.

<b>Course code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112AEC16B	Numerical And Statistical Methods	4	0	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.

### 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
19120SEC01AL	Packages lab –I	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





## UNIT –IV

Communication-Characteristics-Process-Forms-Barriers-Types

## UNIT-V

Listening-benefits-types-good listener-active and passive listening-Tips for effective listening

**Lab Note-1.** Word Mentor - Level I Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, Listening activity from Globarena Software 2.  
Vocabulary diary

**Viva-**Listening activity

**Exam components-**Theory-50+MCQ online exam-vocabulary-20+Viva-15+Lab note-15=100

### OUTCOME:

- Understand grammar
- Develop listening skill

### REFERENCES:-

English Grammar -Wren and Martin  
English Grammar and Composition -Radhakrishna Pillai  
Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

Course Code	Course Title	L	T	P	C
191INDCONS	Indian Constitution	1	0	0	1

### 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.

**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 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
19111AEC21	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
19111AEC22	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:**

- Read and comprehend literature

**REFERENCES:-**

Gathered Wisdom -GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
19120SEC23	Internet and Java Programming	5	1	0	6

**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: [Employability]

Multiple Inheritance – Packages: [Employability]

Putting classes together - Multithreaded Programming

**UNIT-IV**

Managing Errors and Exceptions - Applet programming- Graphics programming  
 [Employability]

**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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC24L	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.

<b>Course code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112AEC25B	Discrete Mathematics	5	0	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 – 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.



## **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

Course Code	Course Title	L	T	P	C
19112AEC26B	Operations Research	4	0	0	4

### 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, Minimax, criteria of optimality — Dominance property - Algebraic and graphical method of solution of solving 2 x 2 games.

### UNIT — V

PERT computation — Resource scheduling.

### REFERENCES BOOK

1. Hamdy A. Taha: Operation Research - An Introduction 5<sup>th</sup> 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
- Students gets the knowledge about inventory theory

Course Code	Course Title	L	T	P	C
19120SEC02AL	Packages lab –II	0	0	2	1

## **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	Course Title	L	T	P	C
19160SEC02B	Self Development	0	0	3	2

**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	Course Title	L	T	P	C
19111SEC02L	Communicative English Lab -II	0	0	2	1

**AIM:**

- To acquaint with the basic grammar and develop language skills

**OBJECTIVE:**

- To understand the different tenses and use it in sentences
- To form sentences
- To know subject verb agreement
- To enrich vocabulary
- To read and comprehend the context

**OUTCOME:**

- Understand grammar
- Develop reading skills

**UNIT-1**

Tenses-Simple, Perfect

**UNIT -II**

Tenses-Continuous, Perfect continuous

**UNIT -III**

Forming sentences-positive, negative and questions

**UNIT -IV**

Concord

**UNIT -V**

Reading-benefits-purpose-techniques-types-tips for effective reading

**Lab Note-1.** Word Mentor - Level II Words and their meaning-Root and usage-Fill in the blanks-Synonyms-Antonyms-Match the Words, reading activity from Globarena Software 2. Newspaper Article notebook

**Viva-Reading activity**

**Exam Components**-Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**REFERENCES:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC31	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
19111AEC32	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
19120SEC33	Visual Programming	5	0	0	6

**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 [Employability]

– Scope of a constant – Converting data types – arrays – Declaring arrays

[Employability]

– Fixed size arrays – Dynamic arrays – Preserve keywords – ReDim. Writing code in Visual Basic – The anatomy of a procedure [Employability]

– Subroutine and Functions [Employability]

– 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: [Employability]

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 [Employability]

–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)

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC34L	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

Course Code	Course Title	L	T	P	C
19113AEC35A	Applied physics –I	4	0	0	6

### 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: ELECTROSTATIC

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.

Course Code	Course Title	L	T	P	C
19113AEC36AL	Applied physics Lab-I	0	0	3	2

1. Semiconductor diode Characteristics
2. Zener diode characteristics
3. Transister 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 Code	Course Title	L	T	P	C
19120RMC37	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-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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC03AL	Packages lab – III	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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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19160SEC03B	Interpersonal Relations and Social Responsibilities	0	0	3	2
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### **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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111SEC03L	Communicative English Lab-III	0	0	2	1

#### **AIM:**

To acquaint with the basic grammar and develop language skills

#### **OBJECTIVE:**

- To change a sentence from active to passive and vice versa
- To make sentences
- To write a letter
- To improve vocabulary
- To enhance speaking skills



- To enrich writing skills

### **UNIT –I**

Active and Passive

### **UNIT –II**

Developing the hints

### **UNIT –III**

Letter writing

### **UNIT –IV**

Speaking-benefits-features of a good speaker-Tip for improving speech-types

### **UNIT –V**

Writing-benefits-types-tips for improving writing

**Lab Note-1.** Anagrams, Word Traps, Stinging Words, letter writing from Globarena Software, Self-introduction, 2. Picture writing note book

**Viva-**Self introduction, Picture talk

**Exam components-**Theory -50+MCQ online exam -20+Viva-15+Lab note-10=100

### **OUTCOME:**

- Understand grammar
- Develop speaking and writing skills

### **REFERENCES:-**

English Grammar

-Wren and Martin

English Grammar and Composition

-Radhakrishna Pillai

Technical Communication

-Meenakshi Sharma & Sangeetha Sharma

Essentials of Business Communication

-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

COURSE CODE	COURSE TITLE	L	T	P	C
19111AEC41	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
19111AEC42	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

Course Code	Course Title	L	T	P	C
19120SEC43	Active Server Programming	5	1	0	6

**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 [Employability]  
 -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  
[Employability] -retrieving form data-using text boxes and text areas

### UNIT III

Cookies[Employability]

-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 [Employability] – connecting to Microsoft SQL server-Connecting to a Microsoft access database

### UNIT IV

About the connection object – executing a SQL statement [Employability] with the connection object- Understanding session and connection pooling – working with record sets [Employability] -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 [Employability] -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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC44L	Active Server Programming Lab	0	0	3	4

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 Code	Course Title	L	T	P	C
19113AEC45A	Applied physics –II	6	0	0	6

**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.

Course Code	Course Title	L	T	P	C
19113AEC46AL	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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04AL	Packages lab - IV	0	0	2	1

### **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



<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC04B	Etiquette And Interviewing Skills	0	0	3	2

### **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	Course Title	L	T	P	C
19111SEC04L	Communicative English Lab -IV	0	0	1	1

**AIM:**

To develop communicative skills

**OBJECTIVE:**

- To change sentences from direct to indirect and vice versa
- To comprehend a passage
- To enhance language skill
- To develop presentation skill
- To enrich vocabulary

**UNIT –I**

Direct and Indirect

**UNIT –II**

Comprehension

**UNIT –III**

Conversation

**UNIT –IV**

Descriptive Writing

**UNIT –V**

Soft skills-Importance-aspects-SWOT analysis-values-positive attitude-perception

**Lab Note-** Confusing Words, Word families, Non-English words, Presentation skills, Oral presentation, Conversation from Globarena software

**Viva-**Presenting a topic

**Exam components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**OUTCOME:**

- Understand grammar
- Develop language and presentation skills

**REFERENCES:-**

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons
Soft skills	-D.Jayacandran D.J Publishers

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

**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.**

#### **REFERENCE BOOK:**

1. “ENVIRONMENTAL STUDIES”, K.Kumarasamy, A.Alagappa Moses, M.Vasanthi.

Course Code	Course Title	L	T	P	C
19120SEC51	Data Communication and Networking	5	0	0	5

**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 [Employability]  
-TCP/IP suite - Addressing.

**UNIT-II**

Trasmission media-Connecting Devices-Error detection and correction [Employability]  
-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: [Employability] Cellular telephony- Generations- Satellite-GSM-GPRS-Internet-WWW-HTTP

**UNIT-V**

Attacks-Web security consideration-SNMP-Secure Socket Layer- Principles of public key cryptography [Employability] - 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

Course Code	Course Title	L	T	P	C
19120SEC52	Operating System	4	1	0	5

**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 [Employability]  
– Different views of Operating System – Design and Implementation of Operating System – I/O Programming concepts – Interrupts Structure & Processing.

## UNIT II

Memory Management [Employability] : 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 [Employability] : Job Scheduling – Process Scheduling – Functions and Policies – Evaluation of Round Robin multiprogramming performance – Process Synchronization [Employability] – Race Condition – Synchronization Mechanism – Deadly Embrace, Prevention , Avoidance and Detection and Recovery Methods.

## UNIT IV

Device Management [Employability] : Techniques for Device Management – Device Characteristics – I/O Traffic Controller, I/O Scheduler, I/O Device Handler – Virtual Devices [Employability] – Spooling.

## UNIT V

File management: [Employability] 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

Course Code	Course Title	L	T	P	C
19120SEC53	Microprocessor and its Applications	4	1	0	5

### 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 [Employability]

– single chip microcomputers – memory buses -memory address capacity – Intel 8085 – instruction cycle – timing diagram.

### UNIT II

Instruction set of Intel 8085 [Employability] – instruction and data formats – addressing modes – status flags – Intel 8085 instruction – programming of microprocessors – assembler [Employability] – stacks and subroutines – macros and microprogramming.

### UNIT III

Assembly language programming [Employability] – 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 [Employability] – 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 [Employability] - 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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC54L	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 Code	Course Title	L	T	P	C
19120SEC55L	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 Code	Course Title	L	T	P	C
19120DSC56A	Cloud Computing	5	0	0	4

**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 [Employability]**  
– 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 [Employability]**  
– On Event Management – On Contact Management – On Project Management – On Word Processing – On Spreadsheets – On **Databases [Employability]** – On Presentations

**UNIT IV**

**Storing and Sharing Files [Employability]** and other online content – Sharing Digital Photographs – Controlling it all with Web-Based Desktops

**UNIT V**

Collaborating via **Web-Based Communication Tools [Employability]** – 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.

Course Code	Course Title	L	T	P	C
19120DSC56B	Software Engineering	5	0	0	4

**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

- 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 [Employability] - introduction - defining the problem - developing a solution strategy - planning the development process - planning an organizational structure - other planning activities.

**UNIT II**

Software cost estimation [Employability] - 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 [Employability] - modules and modularization criteria - design notations - design techniques - detailed design considerations - real time and Distributed system design [Employability] - test plans - milestones, walkthrough and inspections - design guidelines.

**UNIT IV**

Implementations issues [Employability] - structured coding techniques - coding style - standards and guidelines - documentation guidelines - data abstraction - exception handling - concurrency mechanisms.

**UNIT V**

Verification and validation techniques [Employability] - 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.

**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

**REFERENCE BOOK:**

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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC05AL	Packages Lab –V	0	0	2	1

## **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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC05B	Leadership Skills and Body Language	0	0	3	2

**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	Course Title	L	T	P	C
19111SEC05L	Communicative English Lab-V	0	0	2	1

**AIM:**

To develop communicative skills

**OBJECTIVE:**

- To understand the degrees of comparison
- To build up a thought
- To write resume
- To construct report, agenda and minutes
- To prepare for an interview

**UNIT –I**

Degrees of comparison

**UNIT –II**

Proverb expansion

**UNIT –III**

Resume writing

**UNIT –IV**

Interview

**UNIT –V**

Corporate skills-body language-etiquette-good manners-interpersonal skills

**Lab Note-** Report writing, Resume writing, Interview from Globarena software, Writing agenda, Writing minutes

**Viva-Mock Interview**

**Exam components-**Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**OUTCOME:**

- Develop communicative skills
- To get a job

**REFERENCES:-**

English Grammar -Wren and Martin  
 English Grammar and Composition -Radhakrishna Pillai  
 Technical Communication -Meenakshi Sharma & Sangeetha Sharma  
 Essentials of Business Communication-Rajendra Pal &J.S Korlahalli Sultan Chand & Sons  
 Soft skills -D.Jayacandran D.J Publishers

Course Code	Course Title	L	T	P	C
19120SEC61	.NET Programming	4	1	0	5

### 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 [Employability] –The elements of Visual Basic .NET

### UNIT II

Visual Basic .NET operators-software Design, [Employability] conditional structures, and controls Flow-Methods.

### UNIT III

Interfacing with the End user- Asp.NET Applications. [Employability]

### UNIT IV

Web Form Fundamentals [Employability] – Web Controls – Validation and Rich Controls.

### UNIT V

ADO.NET Data Access [Employability] – 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.
4. Visual Basic.Net Black Book- Steven Holzner.

Course Code	Course Title	L	T	P	C
19120SEC62	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 [Employability]** -Introduction -Definition of Database system - Data Independence - Relational Systems - **Database System Architecture [Employability]** - Three Levels of the Architecture - Distributed Processing.

#### **UNIT II**

An Introduction to **Relational Databases [Employability]** - Introduction - Relational Model - Relations and Relvars - Optimization - Transactions - An Introduction to **SQL [Employability]** - Embedded SQL - Domains , Relations , Relvars

#### **UNIT III**

**Relational Algebra [Employability]** - Introduction - Syntax - Semantics - Examples - Additional Operators - Relational Calculus - Introduction - Tuple Calculus - Examples - Calculus Vs Algebra - Domain Calculus - SQL Specialties .

#### **UNIT IV**

**Database Design [Employability]** - Functional Dependencies - Introduction - Basic Definitions - **Normalization [Employability]** - First , Second ,Third Normal Forms - BOYCE / CODD Normal Form.

#### **UNIT V**

**Transaction Management [Employability]** - Recovery - Introduction - Transactions - Transaction Recovery - System Recovery - Media Recovery - Concurrency -Three Concurrency Problem - Locking - **Deadlock [Employability]** - 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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC63L	.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 Code	Course Title	L	T	P	C
19120SEC64L	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 Code	Course Title	L	T	P	C
19120DSC65A	Data Mining	5	0	0	4

### 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 [Employability]- Why Data Mining now-The Data Mining Process-Data Mining Application-Data Mining Techniques [Employability]-The Future of Data Mining-Guidelines for Successful Data Mining-Data Mining Software-Software Evaluation and Selection.

### UNIT-II

Association Rules Mining [Employability]: 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 [Employability] - Software for Association Rule Mining

### UNIT-III

Classification: [Employability] Introduction-Decision Tree-Building a Decision Tree [Employability]-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 [Employability]- Improving Accuracy of Classification Methods.

### UNIT-IV

Cluster Analysis: [Employability] 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 [Employability]-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.

Course Code	Course Title	L	T	P	C
19120DSC65B	Artificial Intelligence and Expert Systems	5	0	0	4

**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 [Employability]**- 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 [Employability]**- 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 [Employability]**- 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 [Employability]**- Architectural-Components- Explanation facilities- Knowledge acquisition.

**UNIT V**

**Expert System development process [Employability]**- 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, 2<sup>nd</sup> 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.

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111OEC	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

<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19112OEC	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.

<b>Course Code</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19113OEC	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. Sawhmey – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	COURSE TITLE	L	T	P	C
19114OEC	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

Course Code	COURSE TITLE	L	T	P	C
19117OEC	Mushroom Technology	4	0	0	2

### UNIT-1

Introduction-history-scope of edible mushroom cultivation-types of edible mushroom in India-calacyble indica, volvariella volvacea ,pleurotus sp. Agaricus bisporus

### 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-culturel rack mushroom unit(Thatched mouse)-mushroom bed preparation-paddy straw,sugarcane trash,maiza straw,banana leaves

### UNIT-IV

Storage and nutrition:short term storage-long term storage (Scanning,pickles, papads,drying,storage ion salt solutions)-nutritiion: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,research centres-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,Philip G.Miles,Chang,S.T(2004) Mushrooms: cultivation,nutritional value,medicinal effect and environmental impact,2 nd ,CRC press.
- 5.Swaminathan M.(1990) food nutrition,bappco.The banglore printing and publishing co Ltd.,Banglore.

COURSE CODE	COURSE TITLE	L	T	P	C
17161OEC	Indirect Taxes	4	0	0	2

### AIM:

To make the students to gain expert knowledge in indirect taxes.

### OBJECTIVIES:

- (i) To have practical knowledge on excise duties and customs duties.
- (ii) To learn the fundamentals of service tax, sales tax and VATS.

### 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.

### **OUTCOME**

Students gained knowledge of various provisions of central excise customs law, service tax, VAT and sales tax and their applications in different circumstances.

### **REFERENCE BOOKS:**

1. Income Tax Law and Practice - N.Hariharan.
2. Business Taxation – T.S.Reddy/Hari Prasad Reddy.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC06AL	Packages Lab -VI	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 Movie Clip and Graphic Symbols.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC06B	Life Skills and Other Skills	0	0	3	2

**UNIT I            Life Skills**

**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	Course Title	L	T	P	C
19111SEC06L	Communicative English Lab -VI	2	0	0	1

**AIM:**

To develop communicative skills

**OBJECTIVE:**

- To write simple, compound and complex sentences
- To extract the main ideas from a text
- To shorten a text
- To enhance writing skills
- To learn to manage time and stress
- To widen creative thinking
- To enrich the skill of working in a group

**UNIT –I**

Simple, Compound and Complex

**UNIT –II**

Note making

**UNIT –III**

Precise writing

**UNIT –IV**

Developing a story

**UNIT –V**

Essay writing

**Lab Note**-Creative thinking, Time management, Stress management, Assertiveness, Group discussion from Globarena Software

**Viva**-Group discussion

**Exam components**-Theory -50+MCQ online exam-20+Viva-15+Lab note-15=100

**OUTCOME:**

- Develop communicative skills
- To be a good team worker

**REFERENCES:-**

English Grammar	-Wren and Martin
English Grammar and Composition	-Radhakrishna Pillai
Technical Communication	-Meenakshi Sharma & Sangeetha Sharma
Essentials of Business Communication	-Rajendra Pal & J.S Korlahalli Sultan Chand & Sons

Course Code	Course Title	L	T	P	C
19120PRW67	Project Work	0	0	0	4



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 B.Sc.,(CS) curriculum, the following Research Skill Based Courses are introduced in the B.Sc.,(CS) curriculum.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
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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THANJAVUR – 613 403 - TAMIL NADU

**SCHOOL OF ARTS & SCIENCE**

**DEPARTMENT OF COMPUTER SCIENCE**

**MASTER OF COMPUTER APPLICATIONS**  
**(MCA)**  
**CURRICULUM**

# **REGULATION 2019**



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THANJAVUR – 613 403 - TAMIL NADU

## **SCHOOL OF ARTS & SCIENCE**

### **Department of Computer Science**

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Department	:	COMPUTER SCIENCE
Programme	:	MCA

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#### **M.C.A., Graduate Attributes :**

- Information Literacy
- Problem Analysis
- Design/development of solutions
- Modern tool usage
- Professional and Ethical understanding

#### **M.C.A., Programme Educational Objectives-PEO**

- PEO1-To understand the different methods of organizing large amounts of data.
- PEO2-To introduce GUI programming using Microsoft Foundation Classes
- PEO3-To learn the fundamental concept of Web Design.
- PEO4-To develop network programs in java.
- PEO5-Provides idea on VLAN, VTP, STP and Inter-VLAN Routing.
- PEO6-To know the network security tools and system level security used
- PEO7-To get an idea about Sharing Files.

#### **M.C.A., Programme Outcomes –PO**

- PO1- Apply the different data structures for implementing solutions to practical problems
- 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

## **M.C.A., Courses –C**

- **C1-** C Programming and Data structure
- **C2-** Data communication network
- **C3-** Computer Architecture
- **C4-** Programming in VB
- **C5-** OOPs with C++
- **C6-** Operating system
- **C7-** Web Designing
- **C8-** Database Management system
- **C9-** J2EE Programming
- **C10-** Relational Data Base Management System.
- **C11-** Routing and Switching in LAN
- **C12-** Python Programming
- **C13-** Cryptography Network security
- **C14-** Open Source programming
- **C15-** Web Service
- **C16-** Data mining and warehousing
- **C17-** Grid and Cloud Computing.
- **C18-** .NET Programming
- **C19-** Object Oriented System Design
- **C20-** Human Computer Interaction.
- **C21-** Software Project Management.
- **C22-** Big Data.



**M.C.A., Curriculum Mapping  
 Programme Educational Objectives-PEO vs Programme Outcome-PO**

<b>Programme Outcome-PO Programme Educational Objectives-PEO</b>	<b>PO1</b>	<b>PO2</b>	<b>PO3</b>	<b>PO4</b>	<b>PO5</b>	<b>PO6</b>
<b>PEO1</b>	✓				✓	
<b>PEO2</b>		✓		✓		
<b>PEO3</b>			✓			✓
<b>PEO4</b>		✓		✓		✓
<b>PEO5</b>	✓		✓			
<b>PEO6</b>				✓		
<b>PEO7</b>	✓	✓			✓	

## M.C.A., 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					✓	✓
CO10	✓		✓		✓	
CO11			✓	✓	✓	✓
CO12			✓			✓
CO13						✓
CO14		✓				
CO15					✓	
CO16	✓				✓	
CO17					✓	
CO18			✓			
CO19		✓				
CO20					✓	
CO21			✓		✓	
CO22	✓					



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**SCHOOL OF ARTS & SCIENCE**  
**Department of Computer Science**

**M.C.A.,**

(For the candidates admitted in the academic year 2019-2020 onwards)  
(For Lateral Entry candidates admitted in the year 2020-2021 onwards)  
Research Integrated Curriculum 2017-2018 onwards

**COURSE STRUCTURE**

**Semester I**

Course Code	Course Title	L	T	P	C
19222SEC11	C Programming and Data structure	4	0	0	3
19222SEC12	Data communication network	5	0	0	4
19222SEC13	Computer Architecture	5	0	0	3
19222SEC14	Programming in VB	5	0	0	4
19212AEC15	Numerical and Statistical Methods	5	0	0	4
19222SEC16L	C programming and Data structure Lab	0	0	3	2
19222SEC17L	Programming in VB Lab	0	0	3	2
	<b>Total</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>22</b>

**Semester II**

Course Code	Course Title	L	T	P	C
19222SEC21	OOPs with C++	5	0	0	4
19222SEC22	Operating system	5	0	0	4
19222SEC23	Web Designing	5	0	0	4
19222SEC24	Database Management system	5	0	0	4
19212AEC25	Optimization Technique.	4	0	0	3
19222SEC26L	OOPs with C++ Lab	0	0	3	2
19222SEC27L	Web Designing Lab	0	0	3	2
	<b>Total</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>23</b>

### Semester III

Course Code	Course Title	L	T	P	C
19222SEC31	J2EE Programming	4	0	0	4
19222SEC32	Relational Data Base Management System.	4	0	0	4
19222SEC33	Routing and Switching in LAN	4	0	0	4
19212SEC34	Discrete Mathematics	4	0	0	4
19222SEC35L	J2EE Programming Lab	0	0	3	2
19222SEC36L	RDBMS Lab	0	0	3	2
19222DSC37_	Discipline Specific Elective – I	4	0	0	4
19222RLC38	Research Led Seminar	-	-	-	1
<b>Total</b>		<b>22</b>	<b>0</b>	<b>8</b>	<b>25</b>

### Semester IV

Course Code	Course Title	L	T	P	C
19222SEC41	Python Programming	4	0	0	4
19222SEC42	Cryptography Network security	4	1	0	4
19222SEC43	Open Source programming	4	0	0	3
19222SEC44	Web Service	4	0	0	3
19222SEC45L	Python Programming Lab	0	0	3	2
19222SEC46L	Open Source programming Lab	0	0	3	2
19222DSC47_	Discipline Specific Elective – II	5	0	0	4
19222RMC48	Research Methodology	3	0	0	3
19222BRC49	Participation in Bounded Research	0	0	0	2
<b>Total</b>		<b>24</b>	<b>1</b>	<b>6</b>	<b>27</b>

### Semester V

Course Code	Course Title	L	T	P	C
19222SEC51	Data mining and warehousing	6	1	0	6
19222SEC52	Grid and Cloud Computing.	6	1	0	5
19222SEC53	.NET Programming	5	0	0	4
19222SEC54	Object Oriented System Design	5	0	0	4
19222SEC55L	.NET Programming Lab.	0	0	3	2
19222DSC56_	Discipline Specific Elective – III	5	0	0	4
19222SRC57	Societal project (Mini Project)	0	0	0	2
<b>Total</b>		<b>25</b>	<b>2</b>	<b>3</b>	<b>27</b>

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC61	Human Computer Interaction.	6	0	0	6
19222SEC62	Software Project Management	6	0	0	5
19222SEC63	Big Data	6	0	0	5
19222PRW64	Project work	0	0	15	10
19222PEE	Program Exit Examination	-	-	-	2
	<b>Total</b>	<b>5</b>	<b>0</b>	<b>26</b>	<b>28</b>
	<b>Total Credits of the Programme</b>				<b>152</b>

### Semester VI

#### DISCIPLINE SPECIFIC ELECTIVE COURSES:

<b>Semester</b>	<b>Discipline Specific Elective Courses</b>
III	19222DSC37A - Mobile Computing / 19222DSC37B - Knowledge based decision support system
IV	19222DSC47A - Game Programming / 19222DSC47B - Multimedia and Graphics
V	1922256A - Information Security / 1922256B - Wireless communication Network

#### CREDIT DISTRIBUTION

<b>SEMESTER</b>	<b>AEC</b>	<b>SEC</b>	<b>DSC</b>	<b>GEC</b>	<b>RESEARCH</b>	<b>OTHERS</b>	<b>TOTAL</b>
I	4	18					<b>22</b>
II	3	20					<b>23</b>
III		20	4		1		<b>25</b>
IV		18	4		5		<b>27</b>

V		21	4		2		<b>27</b>
VI		16			10	2	<b>28</b>
<b>TOTAL</b>	<b>7</b>	<b>113</b>	<b>12</b>		<b>18</b>	<b>2</b>	<b>152</b>

CourseCode	Course Title	L	T	P	C
19222SEC11	C Programming and Data structure	4	0	0	3

**AIM:**

To provide an in-depth knowledge of Creating C Programs and data structure

**OBJECTIVES:**

- To learn the systematic way of solving problems.
- To understand the different methods of organizing large amounts of data.
- To learn the programming concept.

**UNIT I**

Evaluation and Application of C – Structure of a C program – Data types – Declaration – Operators- Expression- Type conversion- Built-in-Function. Data input and output- Control statements: IF, ELSE-IF, GOTO, SWITCH, WHILE –DO, DO-WHILE, FOR, BREAK and CONTINUE. [Employability]

**UNIT II**

Functions: Defining and accessing functions – passing parameters to functions- arguments – Recursive functions- Storage classes-Arrays: Defining and processing Arrays – Multidimensional arrays – Passing arrays to functions – Arrays and Strings –String functions- String manipulation. [Employability]

**UNIT III**

Pointers- Pointer declaration- operations on pointers – pointers to functions – pointers and strings – pointers and arrays – array of pointers- structures- structures and pointers- [Entrepreneurship]

**UNIT IV**

Primitive Data Structures – The notion of a data structure – Arrays – Ordered list – Representation of arrays – Stacks – Evaluation of expressions – Queue – Circular Queue. [Employability]

**UNIT V**

List Structures: List – Singly linked lists – Linked stacks and queues – Storage pool – Polynomial addition - doubly linked lists – Tree structures fundamentals – Binary tree. [Entrepreneurship]

**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
- Apply the different data structures for implementing solutions to practical problems.
- Develop searching and sorting programs.

**REFERENCES:**

1. “Programming in C” – E.Balagurusamy- TataMcGraw-Hill Publication

2. "Fundamentals of Data Structures" ,Ellis Horowitz, Sartaj Sahni, , Galgotia Book Source, New Delhi
3. "Programming wirh C"- Byron S Gottfried - Schaum,s Outline Series - Tata Mcgraw-Hill publications.
4. "The Sprit of C" - Mullish Cooper - Schaum's Outline Series - McGraw-Hill publications.
5. "Let us C" - Yeswant Kenetkar - BPB Publications.

Course Code	Course Title	L	T	P	C
19222SEC12	Data communication network	5	0	0	4

#### AIM

To promote the international exchange of information related to communication systems.

#### OBJECTIVES:

- To understand the concepts of data communications.
- To study the functions of different layers.
- To describe communication protocols , data transmission modes, and satellite communication.

#### UNIT I

Introduction – Basic concepts – The OSI model [Employability]

#### UNIT II

Transmission of digital data – Transmission media – Error detection and Correction [Employability]

#### UNIT III

Data link control – Data link protocols – Local area networks [Employability]

#### UNIT IV

Metropolitan area networks – Switching – ISDN [Employability]

#### UNIT V

Networking and internetworking devices – Network Security [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

#### REFERENCES:

1. "Data communication and Networking", Behrouz A. Forouzan Tata McGraw hill edition
2. "Data and Computer Communications", William Stallings,PHI Pvt Ltd.



Course Code	Course Title	L	T	P	C
19222SEC13	Computer Architecture	5	0	0	3

**AIM :**

To discuss the basic structure of a digital computer and to study in detail the organization of the Control unit, the Arithmetic and Logical unit, the Memory unit and the I/O unit.

**OBJECTIVES :**

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the operation of the arithmetic unit including the algorithms & implementation of fixed-point and floating-point addition, subtraction, multiplication & division.
- To study in detail the different types of control and the concept of pipelining.
- To study the hierarchical memory system including cache memories and virtual memory.
- To study the 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.

## **OUTCOMES:**

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

- Design arithmetic and logic unit.
- Design and analyze pipelined control units
- Evaluate performance of memory systems.
- Understand parallel processing architectures.

## **REFERENCES:**

1. Computer System Architecture - Morris Mano.M PHI, Third Edition - 1999
2. Digital Computer Fundamentals – Thomas C. Barte- Sixth Edition - TataMcGrawHill.
3. Digital Design – Mano – Second Edition.

Course Code	Course Title	L	T	P	C
19222SEC14	Programming in VB	5	0	0	4

**AIM:**

To make the students to understand the windows programming concepts including Microsoft Foundation Classes.

**OBJECTIVES:**

- To introduce the concepts of windows programming.
- To introduce GUI programming using Microsoft Foundation Classes.
- To enable the students to develop programs and simple applications using Visual Basic.

**UNIT I**

Introduction to Visual Basic – IDE – Features of VB editor- Anatomy of a form – Working with form properties – Introducing form events and form methods. .

**UNIT II**

Variables in Visual Basic – Declaring Variables – Data types – Null values Error Value – Empty Value – Scope of a variable – Module level variables – Constants Creating our own constants – Scope of a constant – Converting data types- Arrays - Declaring arrays – PRESERVE Keyword – Redim- Writing codes in VB - Anatomy of a procedure –Subroutines and Functions – Language constructs – For.. Next, While loop Select case. End select, exit statement, with structure

**UNIT III**

Selecting and using controls - Introduction to standard controls – command buttons – textbox – Labels – option buttons - check box – Frame control - List Box - Combo box – Image Object – picture box - timer - scroll bar. File system controls –drive list box-directory list box – file list box.

**UNIT IV**

Introduction to built-in-ActiveX Control - Tool bar - Tree View Control - List View Control - Image list control - Common dialogue box control - Status Bar control - Rich Text Box Control - Menu editor.

**UNIT V**

DDE properties- DDE methods – OLE properties – Active control creation and usage – Active X DLL creation and usage - Data base access - Data control - Field control - Data grid Record set using SQL to manipulate the data - ODBC. The Data Report Designer: Design time operations - Run time operations. **[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).
- 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.

- Write Windows applications using forms, controls, and events

## **REFERENCES:**

1. Programming with visual basic – 6.0 – Mohamed Azam – Vikas Publishing Pvt Ltd. Reprint 2003.
2. Programming Microsoft Visual Basic 6.0 - Francesco Balena – WP Publishers and Distributors Pvt Ltd.
3. Visual Basic 6 from the Ground up – Gary Carnell – Tata McGraw Hill Edition
4. Mastering Visual basic 6.0 – Evangelos petroustos – BPB Publications

CourseCode	Course Title	L	T	P	C
19212AEC15	Numerical and Statistical Methods	5	0	0	4

**AIM:**

To provide an in-depth knowledge of Numerical and Statistical Methods.

**OBJECTIVES:**

- To understand that how to find the real roots by iterative methods
- To find out the solution of simultaneous Linear equations by using Gauss Jacobis, Seidel, Jordan, elimination.

**UNIT I**

Algebraic and Transcendental equations- the iteration method - the Newton Raphson method—false position method-the bisection method.

**UNIT II**

Interpolation-finite differences-Newton's formulae for interpolation-Lagrange's formulae for interpolation—Gaussian elimination method-Gauss-Seidel method.

**UNIT III**

Numerical differentiation 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 t distribution for mean, simple correlation and proportion. Chi square test-independents of attributes and goodness of fit-applications.

**REFERENCES:**

- 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
19222SEC16L	C programming and Data structure Lab	0	0	3	2

1. Write a C program to find the roots of Quadratic Equation and hence determine the roots.
2. Write a C program to find the sum of series using a) Sine b) Cosine c) Exponential Series.
3. Write a program in C to read the marks of a student in a particular subject and sort them in ascending order. Also display the lowest and highest marks obtained in the subject.
4. Write a C program to perform Addition, Subtraction and Multiplication for two matrices using Functions depending on user's choice..
5. Write a C program to find a) Mean b) Standard Deviation and c) Variance for a set of n numbers.
6. Write a C program to find the a) Factorial value b) Fibonacci series using Recursion.
7. Write a C program to perform String Manipulations using Pointers.
  - a. Finding the length of the String
  - b. Joining two strings
  - c. String Comparison
  - d. Palindrome Checking
  - e. Counting the number of uppercase letter, Lowercase letter, digits, vowels, special characters, words and lines.
8. Prepare Payroll using sequential files in C. Use appropriate headings to print them in a neat format.
9. Write a C program to implement a Stack as a circular Linked list.
10. Write a C program to implement a Queue.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC17L	Programming in VB 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 scroll your college name from left to right and right to left of the client area.
4. Write a code to design and implement a calculator.
5. Write a program to expand and shrinking an object while program is running.
6. Write a program to create animation by using move method and a timer object.
7. Write a program for preparing student mark list.
8. Write a program to populate the table entities using Data bound control.

Course Code	Course Title	L	T	P	C
19222SEC21	Oops with C++	5	0	0	4

### AIM:

To present the concept of Object Oriented Programming and discuss the important elements of C++.

### OBJECTIVES:

- To understand the concepts of Object Oriented Programming.
- To write programs in simple applications using C++.

### 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 inheritance - 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.

### OUTCOMES

- Able to understand and design the solution to a problem using object-oriented programming concepts.
- Able to use proper class protection mechanism to provide security.
- Able to demonstrate the use of virtual functions to implement polymorphism.
- Able to reuse

### REFERENCES

1. "Object Oriented Programming with C++". E. Balagurusamy Tata Mcgraw Hill publishing Ltd., New Delhi, 1995.
2. Object oriented programming in C++ - Robert Lafore, Galgotia, 1994.
3. C++ The complete reference- Herbert Schilt, 3rd edition, Tata McGraw Hill Pub-Ltd., 1999.
4. Let us C++ - Yeswant kanetkar - BPB Publications, 1999.
5. Programming with C++ - John R. Hubbard - Schaum's Outline Series, 1996.



Course Code	Course Title	L	T	P	C
19222SEC22	Operating system	5	0	0	4

### AIM :

To have a thorough knowledge of processes, scheduling concepts, memory management, I/O and file systems in 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 thorough knowledge of process management
- To have a thorough knowledge of storage management
- To know the concepts of I/O and file systems.

### UNIT I

Operating systems objectives and functions - Operating system and user/computer interface, Operating system as a resource manager - Evaluation of operating systems - serial processing, simple batch systems, multi programmed batch systems , time sharing systems. **[Employability]**

### UNIT II

Process description, process control - processes and threads, Concurrency - principles of concurrency, mutual exclusion, software support, Dekker's algorithm - mutual exclusion - hardware support, mutual messages. Deadlock avoidance. An integrated deadlock strategy. **[Employability]**

### UNIT III

Memory management - memory management requirements. Fixed partitioning, placement algorithm, Relocation in a paging system. Simple segmentation, Virtual memory - paging – Address translation in a paging system. Segmentation – organization, address translation in a segmentation system. Combined paging and Segmentation. Virtual memory – Operating system software – fetch policy, placement policy, and replacement policy. Page buffering resident set management. **[Employability]**

### UNIT IV

Scheduling - types of scheduling, scheduling algorithms, scheduling criteria, FIFO , Round robin , shortest process next , shortest remaining time, Highest response ration and Feedback scheduling performance comparison. Fair-share scheduling I/O management and disk scheduling-organization of the i/o function – the evaluation of the i/o function, Logical structure of the i/o function, i/o buffering, Disk scheduling algorithms, Disk cache. **[Employability]**

### UNIT V

File management - Files , File management systems, File system architecture Functions of file management, File directories - File sharing - Secondary storage management, File allocation. **[Employability]**

### OUTCOMES:

- Able to understand the operating system components and its services
- Implement the algorithms in process management and solving the issues of IPC
- Able to demonstrate the mapping between the physical memory and virtual memory
- Able to understand file handling concepts in OS perspective
- Able to understand the operating system components and services with the recent OS

## REFERENCES:

1. William Stallings "Operating Systems", second edition, Maxwell Mcmillan International editions 1997.
2. Charles Croley "Operating Systems: A design oriented approach", Irwin publications, Chicago 1997.
3. Deitel H.M "An introduction to Operating Systems", Addison wesley publishing co., 1990
4. Silberschatz A. Peterson J.L Galvin p. "Operating System concepts", Third edition Addison wesley publishing co.,

Course Code	Course Title	L	T	P	C
19222SEC23	Web Designing	5	0	0	4

**AIM:**

To enable the students to design and develop the Web pages.

**OBJECTIVES:**

- To learn the fundamental concept of Web Design.
- To understand the concept of Web Technology.

**UNIT I**

Introduction to the Internet – Internet Technologies – Internet browsers - Introduction to HTML. [Employability]

**UNIT II**

Head and body sections – Designing the body section- Ordered and unordered lists - Table handling. [Employability]

**UNIT III**

DHTML and Style Sheet – Frames – Forms. [Employability]

**UNIT IV**

What is XML – Well formed XML – XML Namespace? [Employability]

**UNIT V**

Document Type Definition – XML Schema. [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
- Able to design front end web page and connect to the back end databases.

**REFERENCES:**

1. For UNITs I, II, III: World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2. Beginning XML – David Hunter, Teff Rafter, Joe Fawcett, Eric vander Andrew watt, Forth Edition.
3. “Principles of web design” – Joel Sklar – Vikas publishing house 2001.
4. “XML TM BIBLE” - Eliotte Rusty Harlod IDG books India(P) Ltd 2000. (forUNIT-IV &V)

CourseCode	Course Title	L	T	P	C
19222SEC24	Database Management system	5	0	0	4

**AIM:**

To provide a strong foundation in Database Technology and an introduction to the current trends in this field.

**OBJECTIVES:**

- To learn the fundamentals of data models and to conceptualize and depict a Database System using ER Diagram.
- To make a study of SQL and relational Database Design.
- To know the fundamental concepts of transaction processing – concurrency controls techniques and recovery procedure.

**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:**

- 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. " An Introduction to Database Systems" - C.J.DATE Addison - Wesley Publications - 7th Edition 2000
2. Pipin C.Desai , "An introduction to Database systems", Galgotia Publications Pvt Ltd. 1991.
3. Henry F.Korth and Abraham Silberschatz, " Database System Concepts", McGrawHill 1992.

Course Code	Course Title	L	T	P	C
19212AEC25	Optimization Techniques.	4	0	0	3

**AIM:**

To have a thorough knowledge of understanding real world problems by using Optimization Techniques.

**OBJECTIVES:**

- To find out the solutions of the given variables using various Simplex methods
- To get the various strategies using two person zero sum and dominance properties.

**UNIT I**

Linear Programming: Introduction – History of OR – Meaning of OR- Principles of Modeling – Linear equation – Gaussian Elimination – Formulation of LP models – Graphical solution- Algebraic solutions – Simplex method – Feasibility – Optimality- Artificial variables – M Technique – Transportation problem- Assignment problem.

**UNIT II**

Sequencing Problem: Introduction – Problem of Sequencing – Basic terms used in Sequencing – Processing n jobs through Two Machines – Processing of n jobs through k Machines – processing of 2 jobs through k Machines  
 Game Theory : Introduction – Two persons Zero-sum Games – Some Basic Terms – The maximin-minmax principle – Games with out saddle points – Mixed Strategies – Graphic solution of 2 x n and m x 2 Games – Dominance Property.

**UNIT III**

PERT/ CPM – Introduction – Network and Basic Components – Logical Sequencing – Rules of Network Construction- Critical Path Analysis – Probability consideration of PERT, Distinction between PERT and CPM.

**UNIT IV**

Simulation : Introduction- Methodology of Simulation – Simulation Models – Even type Simulation – Generation of Random Numbers –Mid Square method, Linear congruential Method – Monte-Carlo Simulation – Simulation of inventory problems, Queueing system, Maintenance problems , Investment and Budgeting, Job sequencing , Networks- Advantages and Limitation of Simulation.

**UNIT V**

Replacement Problem: Introduction – Replacement of Equipment/Asset that Deteriorates Gradually - Replacement of Equipment that fails Suddenly – Requirement and Promotion problem – Equipments Renewal Problem – Reliability and system Failure Rates.(Avoid Book works)

**REFERENCES:**

1.“Operations Research “: Kanti Swarup , P.K.Gupta, Manmohan, Sultan chand & Sons – New Delhi.

Course Code	Course Title	L	T	P	C
19222SEC26L	OOPs with C++ Lab	0	0	3	2

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. Consider a shopping list of items for which orders are place with a dealer. The list should include the code number and price of the item. Operation such as adding an item to the list, deleting an item from the list and printing the total value of the order are to be ‘provided for. Write a program to implement the above using a class with arrays as data members.
3. Create a "Times" class with integer data members hours, minutes and seconds. Develop two constructions, one should initialize the data to zero and the other should initialize to fixed values, A member’s function should display it in hh:mm:ss format.
4. Design an abstract base class "Shapes" and derive three classes "Rectangle", “Circle” and Triangle". Develop polymorphic functions “Circumference" and "Computer-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.
5. Develop a program using operator overloading
  - I. To add two complex numbers.
  - II. To find the difference between any given time and the system time
  - III. To multiply to matrices.
6. There are "n" records present in file with each record containing a 6- character item code, a 20-character item name and an integer quantity. Write a program to read these records, arrange them in the ascending order and write them in the same file overwriting the earlier records.
7. Develop a C++ program to implement the following
  - i) Friend function, ii)Inline function iii)Virtual function
8. Write a program which reads a text from a file and the display the following information.
  - i)Number of Lines, ii)Number of words, iii)Number of characters.

Strings should be left-justified and numbers should be right-justified in a suitable field width.
9. Write C++ program to illustrate the use of the following
  - I. Default argument
  - II. Reference variable
  - III. Copy construcor.
10. Develop a "Employee" class having the data members EmpNo, Ename , Basic pay, Dept and Grade. Calculate the DA, HRA, LIC and PF (Assume your own data and percentage). Using these calculate Gross pay and Net pay.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC27L	Web Designing Lab	0	0	3	2

1. Create a small paragraph about 10 lines. Try to use Font, Title and head tags. Apply different sizes and colors using tags.
2. Write a HTML document to print your class Time Table.
3. Develop a Complete Web Page using Frames and Framesets which gives the Information about a Hospital using HTML.
4. Create a web page in the format of front page of a newspaper using text links. Align the text with colors.
5. Develop a web page for job recruitment agency in an IT industry using Forms.
6. Prepare a css for a different edition of Same Book
7. Develop a web page with Text Decoration using DHTML.
8. Develop a web page with additional table using XML.
9. Create web pages which display roll no in sorted order using XML.
10. Create a web page contains your self describing information using XML &XSL



Course Code	Course Title	L	T	P	C
19222SEC31L	J2EE Programming	4	0	0	4

**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.

**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 Schieldt
- 2.Web Enabled Commercial Application Development Using Java 2.0-Ivan Bayross.
3. The Complete Reference J2ee - Keogh

Course Code	Course Title	L	T	P	C
19222SEC32	Relational Data Base Management System.	4	0	0	4

**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.

**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.

Course Code	Course Title	L	T	P	C
19222SEC33	Routing and Switching in LAN	4	0	0	4

**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.

**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.

Course Code	Course Title	L	T	P	C
19212AEC34	Discrete Mathematics	4	0	0	4

**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.

**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.
4. Seymour Lipschutz & March Lipson Tata Mc Graw Hill.
5. C.L.Liu “ Elements of Discrete Mathematics “ Tata Mc Graw Hill.

Course Code	Course Title	L	T	P	C
19222SEC35L	J2EE Programming Lab	0	0	3	2

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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC36L	RDBMS Lab	0	0	3	2

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

Course Code	Course Title	L	T	P	C
19222DSC37A	Mobile Computing	4	0	0	4

#### 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 [Entrepreneurship]

#### UNIT-II

Medium Access Control-SDMA, FDMA, TDMA-Tele Communication System: GSM-Mobile Services-System Architecture-Satellite System: Application, Basics. [Entrepreneurship]

#### 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. [Employability]

#### 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 [Entrepreneurship]

#### UNIT-V

Mobile Application Language: XML, Java, J2ME & Java Card-Mobile Operating System . [Employability]

#### 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.

Course Code	Course Title	L	T	P	C
19222DSC37B	Knowledge Based Decision Support System.	4	0	0	4

**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. [Employability]

**UNIT II**

Formalized symbolic logics – Dealing with inconsistencies and uncertainties – structured knowledge: Graphs, Frames & Related Structures – Object Oriented representations. [Employability]

**UNIT III**

Search and control strategies – Matching Techniques. [Employability]

**UNIT IV**

General concepts in knowledge Acquisition – Learning by induction. [Entrepreneurship]

**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, 2<sup>nd</sup> Edition, 1991.





Course Code	Course Title	L	T	P	C
19222SEC41	Python Programming	4	0	0	4

## 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

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.

[Employability]

### UNIT II

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.

[Employability]

### UNIT III

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.

[Employability]

### UNIT IV

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.

[Employability]

### UNIT V

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.

[Employability]

## REFERENCES:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist‘‘, 2nd edition, Updated for Python 3, Shroff/O‘Reilly Publishers, 2016
2. Guido van Rossum and Fred L. Drake Jr, ?An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
3. Chun, J Wesley, Core Python Programming, 2nd Edition, Pearson, 2007 Reprint 2010.
4. Wesley J Chun Core python Application Programming,3rd Edition,
5. Lutz, Mark, Learning Python, 5th Edition, O Rielly

Course Code	Course Title	L	T	P	C
19222SEC42	Cryptography & Network Security	4	1	0	4

#### 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. . [Employability]

#### 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. . [Employability]

#### 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. . [Employability]

#### 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. . [Employability]

#### 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 – 3<sup>rd</sup> Edition Pearson Education 2003.
2. “Network Security essentials Applications and Standards”, William Stalings , Pearson Education 2007.

Course Code	Course Title	L	T	P	C
19222SEC43	Open Source Programming	4	0	0	3

**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. . [Employability]

**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. . [Employability]

**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. . [Employability]

**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. . [Employability]

**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.

Course Code	Course Title	L	T	P	C
19222SEC44	Web Service	4	0	0	3

**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. . [Employability]

**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. . [Employability]

**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. . [Employability]

**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. . [Employability]

**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. . [Entrepreneurship]

**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.



<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC45L	Python Programming Lab	0	0	3	2

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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC46L	Open Source programming Lab	0	0	3	2

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.

Course Code	Course Title	L	T	P	C
19222DSC47A	Game Programming	5	0	0	4

#### OBJECTIVES:

- To get subsequent understanding of game design and development, which includes the processes, mechanics, and issues in game design, game engine development, modeling, techniques, handling situations, and logic.
- To create interactive games

#### UNIT-I

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. . [Employability]

#### UNIT-II

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. . [Employability]

#### UNIT III

Renderers, Software Rendering, Hardware Rendering, and Controller based animation, Spatial Sorting, Level of detail, collision detection, standard objects, and physics. . [Employability]

#### UNIT IV

Flash, DirectX, OpenGL, Java, Python, XNA with Visual Studio, Mobile Gaming for the Android, iOS, Game engines - Adventure Game Studio, DX Studio, Unity. [Entrepreneurship]

#### UNIT V

Developing 2D and 3D interactive games using OpenGL, DirectX – Isometric and Tile Based Games, Puzzle games, Single Player games, Multi Player games. [Entrepreneurship]

#### 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.

Course Code	Course Title	L	T	P	C
19222DSC47B	Multimedia and Graphics	5	0	0	4

## 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. [Employability]

## 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 – Cross platform Authoring Notes. [Entrepreneurship]

## 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. [Entrepreneurship]

## 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. [Employability]

## 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", 4<sup>th</sup> 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.

Course Code	Course Title	L	T	P	C
19222RMC48	Research Methodology	3	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:**

- 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.

**PREREQUISITIES:**

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) – 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.

**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.

Course Code	Course Title	L	T	P	C
19222SEC51	Data mining and warehousing	6	1	0	6

**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. [Employability]

**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. [Entrepreneurship]

**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. [Employability]

**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. [Entrepreneurship]

**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

Course Code	Course Title	L	T	P	C
19222SEC52	Grid and Cloud Computing.	6	1	0	5

## 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 [Employability]

## UNIT II

Grid Computing Organizations and their roles – Grid Computing analog – Grid Computing road map [Employability]

## UNIT III

Understanding Cloud Computing: An introduction to Cloud Computing – Computing in the Cloud – Developing Cloud Services. [Entrepreneurship]

## UNIT IV

Cloud Computing for the Family – Cloud Computing for the Community – Cloud Computing for the Corporation [Employability]

## UNIT V

Collaborating via Web-Based Communication Tools – Collaborating via Social Networks and Groupware – Collaborating Via Blogs and Wikis [Entrepreneurship]

## 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

Course Code	Course Title	L	T	P	C
19222SEC53	.NET Programming	5	0	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  
[Employability]

**UNIT II**

Visual Basic .NET operators-software Design, conditional structures, and controls Flow-  
Methods. [Entrepreneurship]

**UNIT III**

Interfacing with the End user-Asp.NET Applications. [Employability]

**UNIT IV**

Web Form Fundamentals – Web Controls – Validation and Rich Controls.  
[Entrepreneurship]

**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.

Course Code	Course Title	L	T	P	C
19222SEC54	Object Oriented System Design	5	0	0	4

## 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. [Employability]

## UNIT II

Methodology, modeling, & unified modeling language: object-oriented methodologies-UML. [Entrepreneurship]

## UNIT III

Object-oriented analysis: object –oriented analysis process. Identifying use case –object analysis classification identifying object relation, attribute & methods. [Employability]

## UNIT IV

Object oriented designing: the object oriented designing process & design axioms-designing classes – access layer. [Employability]

## 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 Alibrahmi, mc Graw –hill international edition.

2. "The Unified Modeling Language User Guide". - Grady Boocou, James Rambaugh and Ivar Jacobson
3. Instant UML – Pierre- Alain Muller- Wrox Press Ltd., Shroff Publishers and Distributors Pvt. Ltd.,

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222SEC55L	.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 Code	Course Title	L	T	P	C
19222DSC56A	Information Security	5	0	0	4

## AIM

To impart the fundamental concepts of Information Security and to solve its issues

### UNIT-I

History, Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC, Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues. [Employability]

### UNIT-II

Risk Management : Identifying and Assessing Risk, Assessing and Controlling Risk. [Employability]

### UNIT-III

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 [Employability]

### UNIT-IV

Security Technology, IDS, Scanning and Analysis Tools [Entrepreneurship]

### UNIT-V

Cryptography, Access Control Devices, Physical Security, Security and Personnel [Entrepreneurship]

## REFERENCES

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003.
2. Ron Weber, "Information Systems Control and Audit", Pearson Education, New Delhi, 2004.
3. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
4. Stuart Mc Clure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw Hill, 2003.
5. Matt Bishop, " Computer Security Art and Science", Pearson/PHI, 2002.



Course Code	Course Title	L	T	P	C
19222DSC56B	Wireless communication Network	5	0	0	4

## 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. [Employability]

## UNIT II

Communication Networks – Protocols and TCP/IP suite. [Employability]

## UNIT III

Wireless communication Technology – Antennas and propagation – signal encoding technique – spread spectrum – coding & Error control. [Employability]

## UNIT IV

Wireless networking: satellite communication – cellular wireless networks – cordless systems and wireless local loop – mobile IP and wireless Access protocol. [Entrepreneurship]

## UNIT V

Wireless LANs: Wireless LAN Technology – WiFi and IEEE802.11 –wireless LAN standard – Bluetooth and IEEE 802.15. [Entrepreneurship]

## 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”.

Course Code	Course Title	L	T	P	C
19222SEC61	Human Computer Interaction.	6	0	0	6

**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 [Employability].

**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. [Entrepreneurship]

**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. [Employability]

**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]

**UNIT V**

User Support: Instruction - Requirements of user support - Approaches to user support - Adaptive help system - Designing user support systems. [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.

Course Code	Course Title	L	T	P	C
19222SEC62	Software Project Management	6	0	0	5

#### UNIT I

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview Of Project Planning – Stepwise Project Planning. [Employability]

#### UNIT II

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation. [Employability]

#### UNIT III

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. [Employability]

#### UNIT IV

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. [Entrepreneurship]

#### UNIT V

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]

#### 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
19222SEC63	BIG DATA	6	0	0	5

### OBJECTIVES:

- To explore the fundamental concepts of big data analytics
- To learn to analyze the big data using intelligent techniques .use various techniques for mining data stream
- To understand the various search methods and visualization techniques.

### UNIT- I

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 **[Employability]**

### UNIT -II

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. **[Employability]**

### UNIT -III

History of Hadoop- The Hadoop Distributed File System –Basics-Developing a Map Reduce Application-How Map Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort – Task execution - Setting up a Hadoop Cluster - Cluster specification - Cluster Setup and Installation – Hadoop Configuration-Security in Hadoop **[Entrepreneurship]**

### UNIT -IV

Link Analysis – PageRank - Efficient Computation of PageRank- Topic-Sensitive PageRank – Link Spam- Recommendation Systems- A Model for Recommendation Systems- Content- Based Recommendations - Collaborative Filtering- Dimensionality Reduction- Visualizations - Visual data analysis techniques-interaction techniques- Systems and applications. **[Entrepreneurship]**

### UNIT -V

IBM for Big Data –Framework - Hive – Sharding – NoSQL Databases –Mango DB-Casandra- Hbase – Impala – Analyzing big data with twitter – Big data for Ecommerce – Big data for blogs. **[Employability]**

### OUTCOMES:

- Work with big data platform and Understand the fundamentals of various big data analysis techniques
- 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 the applications of Big Data

## REFERENCES:

1. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014
2. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding BigData: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing, 2012
3. Da Ruan, Guoqing Chen, Etienne E. Kerre, Geert Wets, Intelligent Data Mining, Springer, 2007
4. Franks, "Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics", John Wiley & sons, 2012
5. Glenn J. Myatt, "Making Sense of Data", John Wiley & Sons, 2007

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19222PRW64	Project work	0	0	15	10

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.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
III	Research Led Seminar	1
IV	Research Methodology	3
IV	Participation in Bounded Research	2
V	Design Project/ Socio Technical Project ( Scaffolding 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 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 AND SCIENCE**  
**DEPARTMENT OF COMPUTER SCIENCE**  
**M.Sc., COMPUTER SCIENCE- REGULATION 2017**  
**COURSE STRUCTURE**

**Semester I**

Course Code	Course Title	L	T	P	C
17220SEC11	J2EE Programming	6	0	0	4
17220SEC12	RDBMS	6	0	0	4
17220SEC13	WAP & XML	6	0	0	4
17212SEC14	Discrete Mathematics	6	0	0	4
17220SEC15L	J2EE programming Lab	0	0	3	2
17220SEC16L	RDBMS Lab	0	0	3	2
17220RLC17	Research Led Seminar	-	-	-	1
	<b>Total</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>21</b>

**Semester II**

Course Code	Course Title	L	T	P	C
17220SEC21	Python Programming	5	0	0	4
17220SEC22	Cryptography & Network Security	5	0	0	4
17220SEC23	Software Engineering	5	0	0	3
17220SEC24L	Python Programming Lab	0	0	3	2
17220SEC25L	Core Practical IV : UNIX Lab	0	0	3	2
17220DSC26_	Discipline Specific Elective – I	5	0	0	4
17220RMC27	Research Methodology	4	0	0	3
17220BRC28	Participation in Bounded Research	-	-	-	2
	<b>Total</b>	<b>24</b>	<b>0</b>	<b>6</b>	<b>24</b>

**Semester III**

Course Code	Course Title	L	T	P	C
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17220SEC31	Data Mining and Warehousing	4	0	0	5
17220SEC32	Open Source programming	4	0	0	5
17220SEC33	.Net Programming	4	0	0	4
17220SEC34L	.Net Programming Lab	0	0	3	2
17220SEC35L	Open Source programming Lab	0	0	3	2
17220DSC36_	Discipline Specific Elective – II	5	0	0	4
17220SRC37	Societal project (Mini Project)	0	0	0	4
17220INT38	Internship	0	0	0	2
<b>Total</b>		<b>22</b>	<b>0</b>	<b>6</b>	<b>28</b>

#### Semester IV

Course Code	Course Title	L	T	P	C
17220SEC41	Software Testing	4	0	0	5
17220PRW42	Project work	0	0	0	12
	Total	4	0	0	<b>17</b>
	Total credit for the program				<b>90</b>

#### DISCIPLINE SPECIFIC ELECTIVE COURSES:

Semester	Course Code
II	17220DSC26A - Artificial Intelligence and Expert System
	17220DSC26B- Distributed Operating System
	17220DSC26C- Embedded Systems and Real time operating System
III	17220DSC36A- Multimedia and it's applications
	17220DSC36B- Compiler Design
	17220DSC36C- Wireless communication Network

#### CREDIT DISTRIBUTION

SEMESTER	AEC	SEC	DSC	GEC	RESEARCH	OTHERS	TOTAL
I		20			1		<b>21</b>
II		15	4		5		<b>24</b>
III		18	4		4	2	<b>28</b>
IV		5			12		<b>17</b>
<b>TOTAL</b>		<b>58</b>	<b>8</b>		<b>22</b>	<b>2</b>	<b>90</b>

Course Code	Course Title	L	T	P	C
17222SEC31	Core XI:J2EE Programming	4	0	0	4

**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

**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)

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SEC12	Core II : RDBMS	6	0	0	4

**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 squires – 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.

Course Code	Course Title	L	T	P	C
17220SEC13	Core III : WAP & XML	6	0	0	4

**AIM :** To provide an in-depth knowledge of WAP &XML

**OBJECTIVES:**

- To make the students to understand of the various applications of XML in the areas of information representation
- To understand the concept of Presentation Oriented Publishing
- To know about Message Oriented Computing and Application Configuration.
- To have a knowledge on Web Services Protocols.

**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]**

**TEXT BOOK:**

Unit-1, 2,3: Professional WAP with XML, WML scripts – Charles Arehat.

Unit-4, 5: XML TM BIBLE – Elliotte vusty Harold

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17212SEC14	Core IV: Discrete Mathematics	6	0	0	4

**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.

**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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL15	Core Practical I: : J2EE programming Lab	0	0	3	2

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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL16	Core Practical II: RDBMS Lab	0	0	3	2

- 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

Course Code	Course Title	L	T	P	C
17220SEC21	Core V : Python Programming	5	0	0	4

## 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.

## 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

Course Code	Course Title	L	T	P	C
17220SEC22	Core VII: Cryptography & Network Security	5	0	0	4

## 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 – 3<sup>rd</sup> Edition Pearson Education 2003.
2. “Network Security essentials Applications and Standards”, William Stalings , Pearson Education 2007.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SEC23	Core VIII: Software Engineering	5	0	0	3

**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 soft- ware 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.

**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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL24	Core Practical III: Python Programming Lab	0	0	3	2

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

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL25	Core Practical IV : UNIX 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 Code	Course Title	L	T	P	C
17220DSC26A	Artificial Intelligence and Expert Systems	4	0	0	4

**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. [Employability]

## 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, 2<sup>nd</sup> Edition, 1991.
2. For Units IV, V: David W. Rolston, “**Principles of Artificial Intelligence and Expert Systems Development**”, McGraw Hill.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220DSC26B	<b>Core XII:</b> Distributed Operating System	4	0	0	4

**Aim:** To Acquire Knowledge on Distributed Operating System

**Objectives:**

- This Subject provides students with an in-depth knowledge about the operating system.
- The former treats the standard principles of single processor system, including processes, synchronization, I/O, deadlocks, Memory Management, File Management systems, security.
- This subject covers distributed operating system in detail, including communication process, file system and memory management synchronization but this time in the context of distributed 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]

**REFERENCE BOOK:**

“Distributed Operating System” – Andrew S.Tanenbaum.

“Distributed Operating Systems” – Pradeep K.Sinha.

Course Code	Course Title	L	T	P	C
17220DSC26C	Computer Architecture and Parallel Processing	4	0	0	4

**Aim:**

To understand the basic structure of a digital computer and to study the operations of internal components.

**Objective:**

- To impart the knowledge in the field of digital electronics.
- To impart knowledge about the various components of a computer and its internals.
- To design and realize the functionality of the computer hardware with basic gates and other components using combinational and sequential logic.
- To understand the importance of the hardware-software inter face.

**Unit I:**

**Introduction to Parallel Processing:** Evolution of computer system-Parallelism in Uni processor System- Parallel Computer Structure-architectural classifications schemes-Parallel processing Application.

**Unit II:**

**Memory and Input / Output Subsystems:** Hierarchical Memory Structure-Virtual Memory System- Memory Allocation and Management- Cache Memories and Management- Input / Output Subsystems.

**Unit III:**

**Principles of Pipelining and Vector Processing:** An Overlapped Parallelism- Instruction and Arithmetic Pipelines-Principles of Designing Pipelined Processors-Vector Processing Requirement-Vector Super Computer-Scientific Attached Processors- Recent Vector Processors.

**Unit IV:**

**Multiprocessor Architecture and Programming:** Functional Structures- Interconnection Networks-Parallel Memory Organization-Multiprocessor Operating Systems.

**Unit V:**

**Multiprocessing Control and Algorithms:** Inter process communication mechanism- System Deadlock and Protection-Multiprocessor Scheduling Strategies-Parallel Algorithm Multiprocessor.

**OUTCOMES:**

**After completing this course, the student will be able to:**

- Design digital circuits by simplifying the Boolean functions
- Understand the organization and working principle of computer hardware components mapping between virtual and physical memory
- Acquire knowledge about multiprocessor organization and parallel processing
- Trace the execution sequence of an instruction through the processor

**TEXTBOOK:**

**COMPUTER ARCHITECTURE AND PARALLEL PROCESSING**

-Kai Hwang and Faye' A. Briggs

Course Code	Course Title	L	T	P	C
17222CRM	Research Methodology	3	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:**

- 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.

**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.

Course Code	Course Title	L	T	P	C
17220SEC31	<b>Core XI: Data Mining and Warehousing</b>	4	0	0	5

**AIM:**

To emphasis on the design aspects of Data mining and 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-classification-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 back propagation-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-Data ware 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

**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

Course Code	Course Title	L	T	P	C
17220SEC32	Core X: Open Source programming	4	0	0	4

**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. [Employability]

**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. [Employability]

**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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SEC33	Core IX: .Net Programming	4	0	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.

### **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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL34	Core Practical V: .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) SelectionHint: 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.



<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SECL35	<b>Core Practical VI: Open Source programming Lab</b>	0	0	3	2

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.

Course Code	Course Title	L	T	P	C
17220DSC36A	Core MULTIMEDIA AND IT'S APPLICATIONS	5	0	0	4

**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.

**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**”, 4<sup>th</sup> Edition Tata McGraw – Hill Edition, 2000.
2. **For Units II,III,IV:** John F.Koegel Buferd, “Multimedia Systems”, Published by Addison Wesley Longman, 3<sup>rd</sup> 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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220DSC36B	Compiler Design	5	0	0	4

**AIM :**

To understand the design and implementation of a simple compiler.

**OBJECTIVES:**

- To understand the functions and design of the various phases of a compiler
- To learn the overview of the design lexical analyzer and parser
- To learn the use of compiler construction tools.

**UNIT I**

Introduction to Compilers – Compilers and Translators- Assembly Language – Macros – Structure of a Compiler – Compiler writing tools - Bootstrapping. Lexical Analysis : The role of Lexical Analyzer - Regular expression – Finite Automata - Implementation of lexical analyzer – Context Free Grammars- Derivation and Parse trees.

## **UNIT II**

Parsers – Shift reduce parsing – Operator precedence parsing - Top-down parsing – Predictive parsers – Simple precedence parsers – LR parsers – Constructing SLR parsing tables – Constructing Canonical LR parsing tables – Constructing LALR parsing tables – Using ambiguous grammars.

## **UNIT III**

Syntax directed translation schemes – Implementation of syntax directed translation schemes - Intermediate code - Postfix notation - Parse trees and Syntax trees - Three address codes, Quadruples and Triples - Translation of assignment statements - Boolean expressions - Postfix translation.

## **UNIT IV**

Symbol tables: The contents of a symbol table - Data structures for symbol tables Representing scope information - Implementation of simple stack allocation scheme- Implementation of block structured languages - Storage allocation in FORTRAN - Storage allocation in block structured languages. Errors - Lexical phase errors - syntactic phase errors - semantic errors.

## **UNIT V**

Code optimization : Principle sources of optimization – Loop optimization – Machine dependent optimization - DAG representation of basic blocks .Code Generation: Problems in code generation - A simple code generator – Register allocation and assignment - Code generation from DAGS – Peephole optimization.

## **OUTCOMES:**

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

- Design and implement a prototype compiler.
- Apply the various optimization techniques.
- Use the different compiler construction tools

## **REFERENCES:**

1. Principles of Compiler Design – Alfred V.Aho , Jeffrey D. Ullman
2. Compiler Construction William A. Barrett, Rodney M.Bates
3. Compiler Construction for Digital computer- DAVID GRIES.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220DSC36B	Wireless communication Network.	5	0	0	4

## **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.

## **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”.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220SEC41	Core XVI :Software Testing	4	0	0	5

**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.

**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.

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
17220PRW42	Project work	0	0	0	15

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.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project ( Scaffolding 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 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**





**Department of Physics**  
**B.Sc., PHYSICS – 2019 Regulation**  
**2019-2020**

**Employability**  
**Skill development**  
**Entrepreneurship**  
**Employability/Skill development**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19110AEC11	Tamil-I	4	0	0	2
19111AEC11	Advanced English-I				
19132AEC11	Hindi-I				
19135AEC11	French-I				
19111AEC12	English-I	4	0	0	2
19113AEC13	Properties of Matter	6	1	0	4
19113SEC14L	Properties of Matter Lab	0	0	3	2
19112AEC15A	Calculus and Fourier series	5	0	0	4
19112AEC16A	Algebra and Trigonometry	4	0	0	3
191__SEC01	Skill Based Elective-I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	-	-	-	-
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>19</b>
<b>SEMESTER II</b>					
19110AEC21	Tamil-II	4	0	0	2
19111AEC21	Advanced English-II				
19132AEC21	Hindi-II				
19135AEC21	French-II				
19111AEC22	English-II	4	0	0	2
19113AEC23	Mechanics And special theory of Relativity	6	1	0	4
19113SEC24L	Mechanics Lab	0	0	3	2
19112AEC25A	ODE,PDE and Laplace Transform	5	0	0	4
19112AEC26A	Analytical Geometry in Vector Calculus	4	0	0	3
19113RLC27	Research Led Seminar	-	-	-	1
191__SEC02	Skill Based Elective –II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	1	1
	<b>Total</b>	<b>23</b>	<b>1</b>	<b>6</b>	<b>20</b>
<b>SEMESTER III</b>					

19110AEC31	Tamil-III	4	0	0	2
19111AEC31	Advanced English-III				
19132AEC31	Hindi-III				
19135AEC31	French-III				
19111AEC32	English-III	4	0	0	2
19113AEC33	Heat and Thermodynamics	5	0	0	4
19113SEC34L	Heat and Thermodynamics lab	0	0	3	2
19114AEC35	Chemistry-I	6	0	0	5
19114SEC36L	Volumetric Analysis lab- I	0	0	3	2
19113RMC37	Research Methodology	2	0	0	2
191__SEC03	Skill based Elective- III	0	0	2	1
19111SEC03L	Communicative English Lab-III	0	0	1	1
	<b>Total</b>	<b>21</b>	<b>0</b>	<b>9</b>	<b>21</b>
	<b>SEMESTER IV</b>				
19110AEC41	Tamil-IV	4	0	0	2
19111AEC41	Advanced English-IV				
19132AEC41	Hindi-IV				
19135AEC41	French-IV				
19111AEC42	English-IV	4	0	0	2
19113AEC43	Optics	5	0	0	4
19113SEC44L	Optics Lab	0	0	3	2
19114AEC45	Chemistry-II	6	0	0	5
19114SEC46L	Volumetric Analysis Lab -II	0	0	3	2
19__SEC04	Skill based Elective- IV	0	0	2	1
19111SEC04L	Communicative English Lab-IV	0	0	1	1
191ENVTSTU	Environmental Studies	2	0	0	2
	<b>Total</b>	<b>21</b>	<b>0</b>	<b>9</b>	<b>21</b>
	<b>SEMESTER V</b>				
19113AEC51	Electricity and Magnetism	5	0	0	4
19113AEC52	Atomic Physics	4	1	0	3
19113AEC53	Basic Electronics	4	1	0	4
19113SEC54L	Electricity and Magnetism Lab	0	0	3	2
19113SEC55L	Basic Electronics Lab	0	0	3	2
19113DSC56	Discipline Specific Elective – I	5	0	0	3
19113BRC57	Participation in Bounded research	-	-	-	1
191__SEC05	Skill based Elective- V	0	0	2	1
19111SEC05L	Communicative English Lab-V	0	0	1	1
	<b>Total</b>	<b>18</b>	<b>2</b>	<b>9</b>	<b>21</b>
	<b>SEMESTER VI</b>				
19113AEC61	Digital Electronics & Microprocessor	4	1	0	4
19113AEC62	Elements of Theoretical Physics	5	0	0	5
19113SEC63L	Digital Electronics Lab	0	0	3	2
19113SEC64L	Microprocessor Lab	0	0	3	2
19113DSC65	Discipline Specific Elective –II	5	0	0	3
191__OEC	Open Elective Course	4	0	0	2
19113PRW66	Project Work	-	-	-	4
191__SEC06	Skill based Elective- VI	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	1	1

19113EXACT	Extension Activities	-	-	-	-
19113PEE	Programme Exit Examination	-	-	-	1
	<b>Total</b>	<b>18</b>	<b>1</b>	<b>9</b>	<b>25</b>
	<b>Total Credits for the Programme</b>				<b>127</b>

### Discipline Specific Electives

Semester	Discipline Specific Elective Courses - I
V	a) 19113DSC56A- Energy Physics b) 19113DSC56B- Laser Physics

Semester	Discipline Specific Elective Courses - II
VI	a) 19113DSC65A- Material Physics b) 19113DSC65B- Communication Physics

### Open Elective Course

Semester	General Elective Courses
VI	a) 19110OEC-Tamil Ilakkiya Varalaru b) 19111OEC-Journalism c) 19112OEC-Development of Mathematical Skills d) 19114OEC-Food and Adulteration e) 19116OEC-Wildlife Conservation f) 19120OEC-E-Learning g) 19122OEC-Web Technology h) 19161OEC-Banking Service

### Skill based Electives

Semester	Skill based Elective Courses
I	a) 19120SEC01AL-Package Lab – I b) 19160SEC01B-Soft skill – I
II	a) 19120SEC02AL-Package Lab – II b) 19160SEC02B-Soft skill – II
III	a) 19120SEC03AL-Package Lab –III b) 19160SEC03B-Soft skill – III
IV	a) 19120SEC04AL-Package Lab –IV b) 19160SEC04B- Soft skill – IV
V	a) 19120SEC05AL-Package Lab –V b) 19160SEC05B-Soft skill - V
VI	a) 19120SEC06AL-Package Lab –VI b) 19160SEC06B-Soft skill – VI

### Credit Distribution (2019)

Sem	AEC	SEC	DSC	OEC	Research	NON CGP	Total
I	15	4	-	-	-	-	19

II	15	4	-	-	1	-	20
III	13	6	-	-	2	-	21
IV	13	6	-	-	-	2	21
V	11	6	3	-	1	-	21
VI	9	6	3	2	4	1	25
Total	76	32	6	2	8	3	127

## Skill development

<b>Course Code</b>	□□□□□□□□□□ - I	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19110AEC11</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

வினா. திருவிடைமீட்டுப் பணிகளைப்பற்றும்- கணம், தஞ்சாவூர்

பாட. குதிரைநாடு : தமிழ் முதல் பருவம்

முதலாம் பித்தண்டு

இக்கலை இலக்கியம் - செவ்வியல், சிறுகதை , நாடகம், இலக்கிய வரலாறு

பித்த : 1. செவ்வியல்

தாயுமானவை கவாமிசன் - அத்தார பருவம் - சிதம்பர ரகசியம் - 40 அத்தன்

இராமலிங்க அத்தன் - சிறுகதைநாடு - அருணை விண்ணப்பம் - 40 அத்தன்

கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாணவரும் - 52 அத்தன்

பாரதிதாசர் - புதுமைப்பெண் - 40 அத்தன்

பாரதிதாசன் - பாரதிதாசன் கவிதைகள் , தமிழ் இனிமை , தமிழ் அணவு

பித்த : 2. செவ்வியல்

நாமக்கல் கவிதர் - தமிழ் தேன் - தமிழ் வளக்க சபகம் செவ்வியம் , 40 அத்தன்

ந. பிச்சுபுத்திரர் - வந்தித்தனை - கவிதை கருடன் , 42 அத்தன்

கரதா - தேன்மழை, கவிதை , 22 அத்தன்

கண்ணதாசன் - இலக்கியம் , ஒரு பாணையில் கதை , 54 அத்தன்

அத்தன் ரகுமணி - செந்திர சிறுகதை , குப்பையை சிறையும் சிறுகதை , 80 அத்தன்

பித்த : 3. சிறுகதை

க. சமுத்திரம் - வேரில் புத்திர பண

பித்த : 4. நாடகம்

கு. வெ. பாண்டிரமணியன் , கதைம புத்திர (அரைநடை நாடகம்)

பித்த : 5. இலக்கிய வரலாறு

சிறுகதை , புதினம், நாடகம் அரைநடை , கவிதை , புதுக்கவிதை



<b>COURSE CODE</b>	<b>COURSE TITLE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19111AEC11	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

<b>Course Code</b>	<b>English-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111AEC12</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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

**UNIT –V**

Oliver Twist -Charles Dickens

**References:-**

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan  
Emerald Publishers

<b>Course Code</b>	<b>Core Paper - I</b> <b>Properties Of Matter</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC13</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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 – Preffer 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.

**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.,

<b>Course.Code</b>	<b>PROPERTIES OF MATTER LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC14L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### 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
19112AEC15A		5	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)

### Unit – V

Definition of Fourier series – Finding Fourier coefficients for a given periodic function with period  $2\pi$  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.

<b>Course Code</b>	<b>Allied Paper - II Algebra and Trigonometry</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19112AEC16A</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **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  $\sin^n\theta \cos^m\theta$  (m & n being a positive integer) – Expansion of in a series of sines and cosines of multiples of  $\theta$  ( $\theta$  – given in radius) Expansion of  $\sin\theta$ ,  $\cos\theta$  and  $\tan\theta$  in terms of powers of  $\theta$  (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  $\sin(x+iy)$ ,  $\cos(x+iy)$ ,  $\tan(x+iy)$ ,  $\sinh(x+iy)$ ,  $\cosh(x+iy)$ ,  $\tanh(x+iy)$

### **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	L	T	P	C
19120SEC01AL	Package Lab - I	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
19160SEC01B	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.

<b>Course Code</b>	<b>Communicative English-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC01L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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

**References:-**

A Practical English Grammar  
English Grammar

-A.J Thomson and A.V.Martinet  
-Wren and Martin

<b>Course Code</b>	<b>Indian constitution</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>191INDCONS</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

### **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.

### **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.

**Skill development**

<b>Course.Code</b>	□ □ □ □ □ □ □ □ □ □ - II	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19110AEC21</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

மீதித் தகவல்கள் பக்கத்தைக் கவனம் காட்டுக

பாட. குறியீடு : தமிழ் இலக்கியப் பருவம்

முதலாம் பருவம்

செய்தல் , பத்தி இலக்கியம் , சிற்பலக்கியம் , இலக்கிய வரலாறு

**பகுதி : 1 . செய்தல் :**

1. சிற்பலக்கியத்தின் தோற்றம் - வரலாறு பற்றியும்
2. சிற்பலக்கியத்தின் தோற்றம் - தமிழ் குறியீடுகளை
3. சிற்பலக்கியத்தின் தோற்றம் - சிற்பலக்கியத்தின் தோற்றம்
4. பண்டிதர்களின் - சிற்பலக்கியம் - சிற்பலக்கியத்தின் தோற்றம்

**பகுதி : 2 . செய்தல் :**

5. சுவைகாண்டுகள் - பெருமை சிற்பலக்கியம்
6. சுவைகாண்டுகள் சிற்பலக்கியம் - இலக்கியப் பருவம் - சுவைகாண்டுகள்
7. பருவங்கள் - சுவைகாண்டுகள் சிற்பலக்கியம் - சுவைகாண்டுகள்
8. சுவைகாண்டுகள் - சுவை சிற்பலக்கியம்

**பகுதி : 3 . செய்தல் :**

- 9 - சுவைகாண்டுகள் - பருவம் சுவைகாண்டுகள்
- 10 - சுவைகாண்டுகள் - பருவம் சுவைகாண்டுகள் - சுவைகாண்டுகள் பருவம்
- 11 - சுவைகாண்டுகள் பருவம் சுவைகாண்டுகள் - சுவைகாண்டுகள் பருவம் - சுவைகாண்டுகள் பருவம்
- 12 - சுவைகாண்டுகள் - சுவைகாண்டுகள் பருவம்

**பகுதி : 4 . பருவம்**

- 13 - சுவைகாண்டுகள் - பருவம் சுவைகாண்டுகள்

**பகுதி : 5 . இலக்கிய வரலாறு**

- 14 - பருவம் சுவைகாண்டுகள் , சுவைகாண்டுகள் , ( பருவம் - பருவம் சுவைகாண்டுகள் , பருவம் )

Course Code	Course Title	L	T	P	C
19111AEC21	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

<b>Course Code</b>	<b>English Paper -II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111AEC22</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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

-GowriSivaramanEmeraldPublishers

CourseCode	Core Paper - II	L	T	P	C
19113AEC23	Mechanics and Special Theory of Relativity	6	1	0	4

**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.



**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

<b>Course Code</b>	<b>Core Practical – II Mechanics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC24L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### **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 -  $\mu$  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.

<b>Course Code</b>	<b>Allied Paper - III ODE, PDE And Laplace Transform</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19112AEC25A</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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 Laplace equations 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)  $L(e^{-st}\cos bt)$ ,  $L(e^{-st}\sin bt)$ ,  $L[e^{-st} f(t)]-L[F(t)$ ,  $L[f(t)]$ ,  $L[f'(t)]$

**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

<b>Course Code</b>	<b>Allied Paper - IV</b> <b>3D Vector Calculus</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19112AEC26A</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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)

**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

<b>CourseCode</b>	<b>Skill Based Elective- II Package Lab- II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19120SEC02AL</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### **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.

<b>Course Code</b>	<b>Skill Based Elective -II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19160SEC01B</b>	<b>Self Development</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### **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

<b>Course Code</b>	<b>Communicative English-II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC02L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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	□ □ □ □ □ □ □ □ □ □ - III	L	T	P	C
19110AEC31		4	0	0	2

டுரின்ட் திவ்நினைப் பல்லைக்-ஆதகம் - வல்வம், தஞ்சாவூர்

பாட ஆதியாடு :

தமிழ் ஸ்ரீராம் பதவம்

இரண்பாம் ஆணிடு

செய்ப்புள், ஸ்ப்பியல்லை இலக்கிய வரலாறு

செய்ப்புள்

அகலு : 1

1. சிலப்பதிகாரம் - மனைவறம் படுக்கு னாலை
2. மணிமேகலை - ஆதினாடு செல்வவிட்ட னாலை
3. சிலக சிந்தாமணி - விமலைவர் இவல்பம்

அகலு :2

4. பெரியபுராணம் - இணைவல்லை குடிமார நவபலார் புராணம்
5. சம்பராபாபணம் - கைகவி ஆழ்விணைப் ப.வம்

அகலு :3

6. சீராப்புராணம் - நடு அகலுரல் ப.வம் - 24 வரிலை
7. தேய்காவணி - வாமல் ஆட்சி ப.வம் - முறல் 5 பாடல்லை

அகலு :4

8. நனவெண்பா - வயல்வர னாண்பம் (20 - 51)

அகலு . 5 : இலக்கிய வரலாறு

9. ஸ்ப்பியல்லை , ஐக்குறு ஸ்ப்பியல்லை , புராணல்லை , இதினாடுல்லை

Course Code	Course Title	L	T	P	C
19111AEC31	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

<b>Course Code</b>	<b>English Paper -III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111AEC32</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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

**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

<b>Course Code</b>	<b>Core Paper - III</b> <b>Heat and Thermodynamics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC33</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**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.

<b>Course Code</b>	<b>Core Practical – III Heat and Thermodynamics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC34L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### **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.

<b>Course Code</b>	<b>Allied Paper -II</b> <b>Inorganic, Organic and Physical</b> <b>Chemistry- I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19114AEC35</b>		<b>6</b>	<b>0</b>	<b>0</b>	<b>5</b>

### **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.

### **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 Mcgraw Hill, New Delhi.
3. Paula Yaukanis Bruice – Organic chemistry, prentice Hall.
4. J.D.Lee, concise inorganic chemistry, 5<sup>th</sup> 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.

<b>Course ode</b>	<b>Volumetric Analysis Lab- I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19114AEC36L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

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



<b>Course ode</b>	<b>Research Methodology</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113RMC37</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

### **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, 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	Skill Based Elective -III Package Lab - III	L	T	P	C
19120SEC03AL		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

<b>Course Code</b>	<b>Skill Based Elective-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19160SEC03B</b>	<b>Interpersonal Relations and Social Responsibilities</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### **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.

<b>Course Code</b>	<b>Communicative English-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC03L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

- Wren and Martin

-Meenakshi Sharma &Sangeetha Sharma

<b>Course Code</b>	□□□□□□□□□□; - IV	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19110AEC41</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

பெரிய இயற்கைப் பங்களிப்புகள் கல்வி, தந்திரம்

பல சூழல்கள் : தந்திரம்.

நவீனப் பழக்க இயல்புகள் கல்வி

கல்வி, கல்வி இயல்புகள், கல்வி இயல்புகள், கல்வி, இயல்புகள் கல்வி

பகுதி . 1 : பண்டைய இயல்புகள் - நவீனம்;

1. கல்வி - கல்வி கல்வி - பண்டைய . 11
2. கல்வி - கல்வி கல்வி - பண்டைய . 64
3. பண்டைய - கல்வி கல்வி - பண்டைய . 142
4. பண்டைய - கல்வி கல்வி - பண்டைய . 29
5. கல்வி - கல்வி கல்வி - பண்டைய . 70

பண்டைய இயல்புகள் கல்வி

1. கல்வி - கல்வி கல்வி - பண்டைய . 1
2. பண்டைய - கல்வி கல்வி - பண்டைய . 167
3. கல்வி - கல்வி கல்வி - பண்டைய . 181
4. கல்வி - கல்வி கல்வி - பண்டைய . 290
5. பண்டைய - கல்வி கல்வி - பண்டைய . 347

பண்டைய இயல்புகள் கல்வி

1. கல்வி - கல்வி கல்வி - பண்டைய
2. கல்வி - கல்வி கல்வி கல்வி - பண்டைய
3. கல்வி - கல்வி கல்வி கல்வி - பண்டைய
4. பண்டைய - கல்வி கல்வி - பண்டைய
5. பண்டைய - கல்வி கல்வி - பண்டைய

பகுதி . 2 : கல்வி

1. பண்டைய - பண்டைய . 2
2. கல்வி - பண்டைய . 37

**பொருள்**

1. பணம் - ப.க. எண். 5
2. பத்திரம் - ப.க. எண். 6

**பொருள்**

ப.க. எண் : 6 ,121, 41, 153 ,172 191, 223, 246, 284, 358.

**பதிற்றுப்பத்து**

இரண்டாம் பதிற்று ப.க. எண் . 4 (இலம் தீர் வளி விட்டி)

**அகநாடு .3:**

1. பட்டினப்பாலை - பூநாள் 105 வரிகள்
2. திருக்குறள் - 1.பதிற்று 2.காக்கமுன. 3.பாடி

**அகநாடு . 4 : செய்யுள் அகநாடு :**

(செயுள் - விளக்கம் , செய்யுள்பொருள், உரைச் செய்யுள், இத்தொடர் செய்யுள் , செய்யுள் குறிப்புகள் , வார்ப்பாறுகள், வாய்ப்பு செய்யுள், தொழில் , குறிப்புகள், குறிச் செய்யுள் பூக்கள்)

**அகநாடு . 5 : இலக்கிய அகநாடு**

எண் இலக்கியங்கள் , பதினெண் கிழக்காக்கு பூக்கள் .

Course Code	Course Title	L	T	P	C
19111AEC41	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                                  |

<b>Course Code</b>	<b>English Paper -IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111AEC42</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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



Sub. Code	Core Paper - IV Optics	L	T	P	C
19113AEC43		5	0	0	4

### 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 – Fabryperrot 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.

#### 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.,

<b>Sub. Code</b>	<b>Core Practical– IV Optics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC44L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### 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.

<b>Course Code</b>	<b>Allied Paper-II Inorganic, Organic and Physical Chemistry- II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19114AEC45</b>		<b>6</b>	<b>0</b>	<b>0</b>	<b>5</b>

### **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.

### **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, 6<sup>th</sup> 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
19114AEC46L		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	L	T	P	C
19120SEC04AL	Package Lab -IV	0	0	2	1

### 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
19160SEC04B	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.

<b>Course Code</b>	<b>Communicative English-IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC04L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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

**References:-**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V.Martinet

-Wren and Martin

-Meenakshi Sharma &Sangeetha Sharma



<b>Course Code</b>	<b>Environmental Studies</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>191ENVSTU</b>		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

### **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.

#### **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.

<b>Course Code</b>	<b>Core Paper - V</b> <b>Electricity And Magnetism</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC51</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**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

<b>Course Code</b>	<b>Core Paper - VI</b> <b>Atomic Physics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC52</b>		<b>4</b>	<b>1</b>	<b>0</b>	<b>3</b>

### **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.

#### **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 – Debye's quantum mechanical explanation of the normal Zeeman effect – Anomalous 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.

### **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. Murugesan.
- 2) Modern Physics by J.B. Rajam
- 3) Atomic and Nuclear Physics – N. Subramaniam and Brijlal.

<b>Course Code</b>	<b>Core Paper - VII</b> <b>Basic Electronics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC53</b>		<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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 –  $\alpha$  and  $\beta$  of a transistor – Relation – static characteristic in CB and CE modes – Transistor amplifier – Transistor Biasing.

**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.

**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

<b>Course Code</b>	<b>Core Practical – V Basic Electronics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC54L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### **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) Hartely 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.

<b>Course Code</b>	<b>Discipline Specific Elective -I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19113DSC55A	<b>Energy Physics</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**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.

**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.

**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	Discipline Specific Elective -I	L	T	P	C
19113DSC55B	Laser Physics	5	0	0	4

**Objective:**

To introduce the physical and engineering principles of laser operation and their applications.

**UNIT- I: Fundamentals of LASER**

Spontaneous emission – Stimulated emission – Meta stable state – Population inversion – Pumping – Laser Characteristics

**UNIT II Production of LASER**

Helium – Neon Laser – Ruby Laser – CO2 Laser – Semiconductor Laser

**UNIT III Industrial Applications of LASER**

Laser cutting – Welding – Drilling – Hologram – Recording and Reconstruction of hologram.

**UNIT IV Lasers in Medicine**

Lasers in Surgery – Lasers in ophthalmology – Lasers in cancer treatment

**UNIT V Lasers in Communication**

Optic fibre communication – Total internal reflection – Block diagram of fibre optic communication system – Advantages of fibre optic communication.

**Books for study:**

1. N. Avadhanulu , An introduction to LASERS, S. Chand & Company,2001.

Books for References:

1. William T. Silvast, Laser fundamentals, University Press, Published in South Asia by Foundation books, New Delhi, 1998.

2. K. Thyagarajan and A.K. Ghatak, LASER Theory and Application, Mc Millan, India Ltd, 1984

Course Code	Skill Based Elective Package Lab -V	L	T	P	C
19120SEC05AL		0	0	2	1

### **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.

<b>Course Code</b>	<b>Skill based Elective -V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19160SEC05B</b>	<b>Leadership Skills and Body Language</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

## **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

<b>Course Code</b>	<b>Communicative English-V</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC05L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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

**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

<b>Course Code</b>	<b>Core Paper - VIII Digital Electronics And Microprocessors</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC61</b>		<b>4</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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.

**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.

<b>Course Code</b>	<b>Core Paper - IX ELEMENTS OF THEORETICAL PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC62</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>5</b>

**Aim:**

To learn about the fundamentals of classical formalism

To learn about introduction to quantum mechanics, fundamentals of relativity and astrophysics

**Unit I Lagrangian formalism.**

Mechanics for a system of particle – Constraints – Generalized Co-ordinates – Transformation equations – Configuration space – Principle of virtual work – D’Alembert’s principle – Applications of Lagrange’s equations – Atwood’s machine – Simple pendulum.

**Unit II Hamiltonian formalism**

Phase space – Generalized momentum – Cyclic co-ordinates – Conservation theorem for generalized momentum – Conservation theorem for energy

**Unit III Dual Nature of Matter**

De Broglie concept of matter waves – de Broglie wavelength – Wave velocity and group velocity for the de Broglie waves – Experimental study of matter waves – Davison and Germer experiment – G.P. Thomson’s experiment for verifying de Broglie relation – Heisenberg’s uncertainty Principle – Electron microscope – Gamma ray microscope.

**Unit IV Schrödinger’s wave Mechanics**

Basic postulates of wave Mechanics – Development of Schrödinger wave equation – Time independent and dependent forms of equations – Properties of wave function – Orthogonal and normalized wave function Eigen function and eigen values – Applications of Schrödinger equation – particle in a box- Linear harmonic oscillator – The barrier penetration problem.

**Unit V Photo electric and Compton effects**

Photo electric effect – Lenard, Richardson and Compton experiments – laws of photoelectric emission – Einstein’s photoelectric equation – Millikan’s experiment- Determination of Planck’s constant – photo emissive cell – photo – voltaic cell – photo conductive cell – photo multiplier – Compton effect – Theory – Experimental Verification.

**Learning Outcomes:**

**Books for Reference:**

**BOOKS FOR STUDY**

1. Mechanics and Mathematical Physics – R. Murugesan – S. Chand publications , Edn.2008
2. Modern Physics – R. Murugesan and Kiruthiga Sivaprasath – S. Chand Publications – Multicolor edition – 2008.

**UNIT BOOK CHAPTER/ SECTIONS**

I 1 6.1 6.2 6.3 6.6 6.7 6.10

II 1 10.1 - 10.7

III 2 11.1 11.2 11.3 11.4

IV 2 11.8, 11.10

V 2 1.14, 1.4, 1.8, 1.7, 1.9

**BOOK FOR REFERENCE**

1. Modern Physics – Arthur Beiser – Tata Mc Graw Hill Publications(1998).
2. Astrophysics of the Solar System- K.D.Abhyankar, University Press (India) Private Limited (2012)

<b>Course Code</b>	<b>Core Practical – VI Advanced Digital Electronics Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113AEC63L</b>		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

### 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.

<b>Course Code</b>	<b>Discipline Specific Elective -II</b> <b>Material Physics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113DSC64A</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

## **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.

### **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 – Vontaué’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.

### **Unit – IV: Dielectrics**

Fundamental Definitions – Dielectrics – Different types of electric polarization – Frequency and Temperature effects on polarization – Dielectric loss – Local field on internal field – ClausiusMosotti 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.

## **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.



<b>Course Code</b>	<b>Discipline Specific Elective -II Communication Physics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19113DSC64B</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Objective:** To promote scientific temper among students and update the basic functioning of various communication systems.

### **UNIT- I : Radio transmission and reception**

Transmitter-modulation-need for modulation- types of modulation amplitude, frequency and phase modulation- modulation factor-sideband frequencies in AM wave-limitations of amplitude modulation - frequency modulation-block diagram of AM and FM Transmitter. Receiver- demodulation-AM & FM radio receivers-super heterodyne radio receiver.

### **UNIT -II : Fiber Optic Communication**

Introduction –structure of optical fiber –total internal reflection in optical fiber – principal and propagation of light in optical fiber - acceptance angle - numerical aperture – types of optical fibers based on material – number of modes – refractive index profile - fiber optical communication system (block diagram) - fiber optic sensors – Temperature sensor – fiber optic endoscope.

### **UNIT- III: Radar Communication**

Basic radar system -Radar range –Antenna scanning – Pulsed radar system - AScope-Plan position indicator- Tracking radar- Moving target indicator- Doppler effect-MTI Principle- CW Doppler Radar- Frequency modulator CW Radar.

### **UNIT- IV: Satellite Communication**

Introduction – history of satellites – satellite communication system – satellite orbits – classification of satellites – types of satellites – basic components of satellite communication – constructional features of satellites- multiple access – communication package – antenna- power source – satellite foot points- satellite communication in India.

### **UNIT- V: Mobile Communication**

GSM – mobile services- concept of cell – system architecture – radio interface – logical channels and frame hierarchy – protocols – localization and calling – Handover- facsimile (FAX) – application – VSAT (very small aperture terminals) – Modem – IPTV (internet protocol television ) – Wi-Fi - 3G (Basic ideas only).

### **Books for Study:**

1. Metha V.K., Principles of Electronics, S. Chand & Company Ltd., 2013
2. Anokh Singh and Chopra A.K., Principles of communication Engineering, S. Chand & Company PVT. Ltd., 2013.
3. Mani I. P., A text book of Engineering Physics, Dhanam Publications, Chennai42, 2014.

**Books for Reference:**

1. Poornima Thangam I, Satellite communication, Charulatha Publications, 2012.
2. Dennis Roddy and John Coolen, Electronic Communication, PHI, 1990.
3. William C.Y. lee, Cellular telecommunication (second edition), Tata Mcgraw hill, 1991.

<b>Course Code</b>	<b>General Elective Journalism</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111GEC</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**Aim :**

- To acquaint with the basic knowledge of journalism so that it may enthrust 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                          |

Course code	General Elective	L	T	P	C
19112GEC	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”

<b>Course Code</b>	<b>General Elective Food And Adulteration</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19114GEC</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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

<b>Course Code</b>	<b>General Elective Mushroom Technology</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19117GEC</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>2</b>

### **UNIT-1**

Introduction-history-scope of edible mushroom cultivation-types of edible mushroom in India-calocybe indica, volvariella volvacea, pleurotus sp. Agaricus bisporus

### **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-cultural rack mushroom unit(Thatched mouse)-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 ion 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

### **REFERENCES:**

- 1.Marimuthu et al.,(1991) oyster mushrooms,Dept of plant pathology,TNAU,coimbatore
- 2.Nita Bahl(1988) Hand book of mushrooms.II edition.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,Philip G.Miles,Chang,S.T(2004) Mushrooms:cultivation,nutritional value,medicinal effect and environmental impact,2nd ,CRC press.
- 5.Swaminathan M.(1990) food nutrition,bappco.The bangalore printing and publishing co Ltd.,Bangalore.

Course Code	General Elective	L	T	P	C
19120GEC	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
19122GEC	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 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 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
19161GEC	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.

<b>Course Code</b>	<b>Skill Based Elective Package Lab -V I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19120SEC06AL</b>		<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### 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 Movie Clip and Graphic Symbols.

<b>Course Code</b>	<b>Skill based Elective -VI</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19160SEC06B</b>	<b>Life Skills and other Skills</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>

### **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.

<b>Course Code</b>	<b>Communicative English-VI</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19111SEC06L</b>		<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>

**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

**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

## **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 (Physics)curriculum, the following Research Skill Based Courses are introduced in the B.Sc (Physics)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.Sc., PHYSICS -SYLLABUS – REGULATION 2019**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19213AEC11	Advanced Mathematical Physics	6	1	0	5
19213AEC12	Classical and Statistical Mechanics	6	1	0	5
19213AEC13	Electronics and Communication	6	1	0	4
19213SEC14L	Spectroscopy and General Electronics Lab	0	0	4	2
19213DSC15	Discipline Specific Elective – I	5	0	0	4
19213RLC16	Research Led seminar	-	-	-	1
	<b>Total</b>	<b>23</b>	<b>3</b>	<b>4</b>	<b>21</b>
<b>SEMESTER II</b>					
19213AEC21	Microprocessor and Microcontroller	5	1	0	5
19213AEC22	Quantum Mechanics	5	1	0	5
19213AEC23	Condensed Matter Physics	5	0	0	4
19213SEC24L	Advanced General Experiments Lab	0	0	4	2
19213DSC25	Discipline Specific Elective – II	5	0	0	4
19213RMC26	Research Methodology	3	0	0	2
19213BRC27	Participation in Bounded Research	-	-	-	2
	<b>Total</b>	<b>23</b>	<b>2</b>	<b>4</b>	<b>24</b>
<b>SEMESTER III</b>					
19213AEC31	Electro Magnetic Theory	6	1	0	6
19213AEC32	Nuclear and Particle Physics	6	1	0	6
19213SEC33L	Advanced Electronics Lab	0	0	5	3
19213DSC34_	Discipline Specific Elective – III	5	0	0	4
192_ GEC35_	General Elective	4	0	0	3
19213SRC36	Participation in Scaffold Research (Societal Project)	-	-	-	2
	<b>Total</b>	<b>21</b>	<b>2</b>	<b>5</b>	<b>24</b>
<b>SEMESTER IV</b>					
19213AEC41	Laser Physics And Non Linear Optics	6	1	0	6
19213AEC42	Numerical Methods and Computational Physics	6	1	0	6
19213SEC43L	Numerical Methods Lab with C++ Programming	0	0	5	3
19213DSC44_	Discipline Specific Elective – IV	5	0	0	4
19213PRW45	Project Work	0	0	0	6
19213PEE	Programme Exit Examination	-	-	-	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>5</b>	<b>27</b>
	<b>Total Credits for the Programme</b>				<b>96</b>



### Discipline specific Electives

Semester	Discipline specific Elective Courses- I
I	a)19213DSC15A- Instrumentation b)19213DSC15B- Crystal Growth Processes
Semester	Discipline specific Elective Courses -II
II	a)19213 DSC25A- Atomic and Molecular Physics b)19213DSC25B- Radiation Physics
Semester	Discipline specific Elective Courses -III
III	a)19213 DSC34A- Non-Conventional Energy Physics b)19213 DSC34B- Photonics Devices and Applications
Semester	Discipline specific Elective Courses -IV
IV	a)19213 DSC43A- Nano Science and Technology b)19213 DSC43B- Non-linear Dynamics

### General Electives

Semester	General Elective Courses
III	a) 19211GEC-Writing for the Media b) 19212GEC-Applicable Mathematics Techniques c) 19214GEC- Green Chemistry d) 19215GEC-Bio-analytical Techniques e) 19220GEC-Internet and Web Design f) 19261GEC- Insurance Services g) 19280GEC-Counselling Psychology

### Credit Distribution (2019)

S.No	Sem	AEC	SEC	DSC	OEC	Research	Others	Total
1.	I	14	2	4	-	1	-	21
2.	II	14	2	4	-	4	-	24
3.	III	12	3	4	3	2	-	24
4.	IV	12	3	4	-	6	2	27
<b>Total</b>		52	10	16	3	13	2	96

<b>Course Code</b>	<b>CORE PAPER – I ADVANCED MATHEMATICAL PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC11</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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.

**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 – Parseval's 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 – Rodrigues Formula – Generating Functions – Orthogonality Relations – Important Recurrence Relations.

**UNIT - V: NUMERICAL METHODS**

Principles 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.**

**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.

<b>Course Code</b>	<b>CORE PAPER – II CLASSICAL AND STATISTICAL MECHANICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC12</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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.

**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 – Tertrode 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.

References:

1. Classical Mechanics – Golstien
2. Classical Mechanics – Gupta Kumar

<b>Course Code</b>	<b>CORE PAPER – III ELECTRONICS AND COMMUNICATIONS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC13</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>4</b>

**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.

**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 – Kenndy 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.

<b>Course Code</b>	<b>CORE PRACTICAL –I SPECTROSCOPY AND GENERAL ELECTRONICS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC14L</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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  $q$ ,  $n$ ,  $\sigma$  by elliptical fringes method.
2. Determination of  $q$ ,  $n$ ,  $\sigma$  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.



<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213DSC15A</b>	<b>INSTRUMENTATION</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**Book for Study:**

1. A Course in Electrical and Electronic Measurement and Instrumentation – A.K. Sawhney

<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-I</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213DSC15B</b>	<b>CRYSTAL GROWTH PROCESSES</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**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).

<b>Course Code</b>	<b>CORE PAPER – IV MICROPROCESSOR AND MICROCONTROLLER</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19213SEC21		<b>5</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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).

**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).

<b>Course Code</b>	<b>CORE PAPER – V QUANTUM MECHANICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19213SEC22		<b>5</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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 – Hermiltian Operators and their Properties – Commutation Relation Uncertainty Relation – Bra and Ket Vectors – Schrodiger, 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 Filed – Dirac Equation for a Free Particle. Charge and Current Densities – Dirac Matrices – Plane Wave Solution – Negative Energy States – Spin Angular Momentum – Spin-Orbit Coupling.

**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

<b>Course Code</b>	<b>CORE PAPER – VI CONDENSED MATTER PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC23</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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.

**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).



<b>Course Code</b>	<b>CORE PRACTICAL – II ADVANCED GENERAL EXPERIMENTS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC24L</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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
19213DSC25A	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 CH<sub>4</sub>, C<sub>2</sub>H<sub>6</sub> and C<sub>2</sub>H<sub>4</sub>- 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 .

**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

<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-II RADIATION PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213DSC25B</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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

**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 & Wilkins, 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, 1948).
4. L. Slack and K. Way, Radiations from Radioactive Atoms in frequent use, (United States Government Printing Office, Washington, 1959).
5. K. S. Krane, Introductory Nuclear Physics (John-Wiley, New York 1987).

<b>Course Code</b>	<b>RESEARCH METHODOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213RMC26</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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.

**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

<b>Course Code</b>	<b>CORE PAPER – VII ELECTROMAGNETIC THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC31</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>6</b>

**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.

**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.



<b>Course Code</b>	<b>CORE PAPER – VIII NUCLEAR AND PARTICLE PHYSICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC32</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>6</b>

**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.

**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).

<b>Course Code</b>	<b>CORE PRACTICAL – III ADVANCED ELECTRONICS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC33L</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>3</b>

**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
19213DSC34A		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.

**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:**

- Non- Conventional Energy Sources – G.D. Rai, Kannah Publication.

Course Code	DISCIPLINE SPECIFIC ELECTIVE COURSE-III	L	T	P	C
19213DSC34B	PHOTONICS DEVICES AND APPLICATIONS	5	0	0	4

**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 Dapphire Laser – Colour center Lasers – DPSSL.

**UNIT – II: LIQUID (DYE) AND 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 Ion 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 semiconductor lasers – Semiconductor diode lasers – Heterojunction semiconductor materials – Double Heterostructure 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 – Photomedicine – Lasers in Ophthalmology – Lasers for General Surgery – Lasers In Dermatology – Cardiology – Lasers In Dermatology – Cardiology – Lasers In Density – Lasers Used in Medicine.

**Books for Study:**

1. Koechner. W. Solid State laser engineering (Springer – Verlag, New York, 1992).
2. Svelto, O. Principles of Lasers (Olenum Press, New York, 1976).
3. Schafer F.P. Dye Lasers (Springer – Verlag, Berlin, 1973).
4. Rampal, V.V. Lasers and Applications (South Asian Publishers, New Delhi, 1993).
5. Silfvast, W.T. Laser Fundamentals (Cambridge University Press, 1993)
6. Elton, R.C..X-ray lasers (Academic press 1990).
7. Marshall T.C Free – Electron Lasers (Macmillan Publishing Company, New York, 1985).
8. Thomson, G.II.B. Physics of Semiconductor Devices (John Wiley & Sons, New York, 1980).
9. Sze, S.W. Semiconductor Devices, Physics and technology (John Wiley & Sons, New York, 1977).
10. Corzine, S.W., Yan R.H., Coldren and Zory, P. (Editors), Quantum well Lasers (Academic Press, Orlando, 1993).
11. Koebner, H. (Editors), Industrial Applications of lasers (John Wiley & Sons, New York, 1984).
12. Harry, J.E.Industrial Laser and their applications (McGraw Hill, London, 1974).
13. Keiser.G, optical fiber communication (McGraw Hill, 1991).
14. Denisyak and Yu, N. Fundamentals of Holography (Mir Publishers, Moscow, 1984)
15. Hochstrasser, R.M. and Johnson, C.K. “Lasers in Biology” (laser focus/electro-optics, 21.1985).
16. Wolbarst, M.L. “ Laser application in Medicine and biology” Vol.1 (Plenum Press, New York, 1971).

<b>Course Code</b>	<b>GENERAL ELECTIVE COURSE WRITING FOR THE MEDIA</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19211GEC</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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
19212GEC	General Elective Course Applicable Mathematical Techniques	4	0	0	3

**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



<b>Course Code</b>	<b>GENERAL ELECTIVE COURSE-III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19214GEC</b>	<b>GREEN CHEMISTRY</b>	<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 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 CO<sub>2</sub> - 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

<b>Course Code</b>	<b>GENERAL ELECTIVE COURSE-III BIOANALYTICAL TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19215GEC</b>		<b>4</b>	<b>0</b>	<b>0</b>	<b>3</b>

### 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
19220GEC	Internet and Web Design	4	0	0	3

### 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
19261GEC	Insurance Services	4	0	0	3

**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
19280GEC	Counselling Psychology	4	0	0	3

**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	L	T	P	C
19213AEC41	LASER PHYSICS AND NON LINEAR OPTICS	6	1	0	6

**Aim:**

The aim and objective of the course on Laser Physics and Nonlinear Optics is to expose the M.Sc. students to the basics of the challenging research field of Laser Physics and their use in nonlinear optics.

**UNIT I: Lasers-Fundamentals and Types**

Basic Construction and Principle of Lasing-Einstein Relations and Gain Coefficient - Creation of a Population Inversion- Three-Level System - Four-Level System -Threshold Gain Coefficient for Lasing- Laser types-He-Ne Laser-CO<sub>2</sub> Laser- Nd:YAG Laser- Semiconductor Laser.

**UNIT II: Laser Operation**

Optical Resonator-Laser Modes-Axial modes- Transverse modes-Modification in Basic Laser Structure- Basic Principle of Mode Locking- Active Mode Locking -Passive Mode LockingQ-Switching- Pulse Shaping.

**UNIT III: Laser Beam Characteristics:**

Wavelength-Coherence-Mode and Beam Diameter-Polarizations-Introduction to Gaussian Beam width-Divergence-Radius of Curvature-Rayleigh Range-Guoy Phase Shift-3-D Gaussian Beams -ABCD Law for Gaussian Beam-The Complex Radius of CurvatureTensorial ABCD Law.

**UNIT IV:Focusing of Laser Beam**

Diffraction- Limited spot size-M<sup>2</sup> Concept of Beam Quality-Spherical Aberration- Thermal Lensing Effects-Depth of Focus-Tight focusing of laser beam - Angular Spectrum Representation of Optical Near Field-Aplanatic lens-Focusing of Higher-order laser modesRadially Polarized Doughnut mode-Azimuthally Polarized Doughnut mode.

**UNIT V:Non Linear Optics**

Introduction-Nonlinear Optical Media-The Nonlinear Wave Equation-Scattering Theory Born Approximation-Second-order Nonlinear Optics-Second-Harmonic Generation (SHG) and Rectification-The Electro-Optic Effect-Three-Wave Mixing-Frequency and Phase Matching-

**Third Harmonic Generation-Optical Kerr Effect- Self-Focusing- Four-Wave Mixing (FWM) - Optical Phase Conjugation (OPC)- Use of Phase Conjugators in Wave Restoration.**

**References:**

1. Nanomaterials: Processing and Characterization with Lasers.-Subhash Chandra Singh, Haibo Zeng, ChunleiGuo, and WeipingCai -Wiley-VCH Verlag GmbH & Co. KGaA.(2012).
2. Walter Koechner-Solid state Laser Engineering-6 th edition-Springer
3. Principles of Nano optics -L. Novotny and B. Hecht-Cambridge University Press(2006)
4. Encyclopedia of Optical Engineering- R.G.Driggers,C.Hoffman- Marcel Dekker(2003)
5. Laser Material Processing- M. Steen, J.Mazumder- Springer (2010)
6. Fundamentals of Photonics - Bahaa E. A. Saleh, Malvin Carl Teich-John Wiley & Sons, Inc.

**Books for study:**

1. Nonlinear Optics – D.L. Mills - Basic Concepts, Springer, Berlin 1998.
2. Lasers and Nonlinear Optics -B.B. Laud-2nd Edn. New Age International (P) Ltd., New Delhi, 1991

Course Code	CORE PAPER – IX	L	T	P	C
19213AEC42	NUMERICAL METHODS AND COMPUTATIONAL PHYSICS	6	1	0	6

**Aim:**

The aim and objective of the course on numerical methods and computational physics is to expose the M.Sc. students to the basics of the challenging research field.

**UNIT I: NUMERICAL DIFFERENTIATION AND INTEGRATION**

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 II: INTERPOLATION AND APPROXIMATION**

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: SOLUTION OF EQUATIONS, EIGENVALUE AND INITIAL VALUE PROBLEMS**

Fixed point iteration method – Newton Raphson method – Solution of linear system of equations – Gauss elimination method – 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. Taylor’s series methods – Euler’s method – Modified Euler’s method – Fourth order Runge – Kutta method for solving first order equations.

**UNIT IV: BASICS OF PYTHON PROGRAMMING**

Need for computer languages, 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).

Introduction-Python: Interpreter-Interactive and script mode -Values and types, variables, operators, expressions, statements, precedence of operators, Multiple assignments, comments, input function, print function, Formatting numbers and strings, implicit/explicit type conversion.

**UNIT V: PROBLEM SOLVING USING PYTHON PROGRAMMING**

Control statements and strings in python:Conditional (if), alternative (if-else), chained conditional (if-elif-else). Strings-String slices, string methods and operations.

Functions and Files: Introduction, inbuilt functions, user defined functions, passing parameters - Positional arguments, default arguments, keyword arguments. Files -Text files, reading and writing files.

Data structures: Lists-creating lists, list operations, list methods, Sets-creating sets, set operations - Tuples-Tuple assignment - Dictionaries-operations and methods, Nested Dictionaries.

## REFERENCES

1. E. Balaguruswamy, Numerical Methods (Tata McGraw Hill, Noida, India), 2009.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, PHI Learning Pvt.Ltd.,NewDelhi,2012.
3. ReemaThareja, “Problem Solving and Programming with Python”, OxfordUniversity Press, 2018.
4. Allen B. Downey, “Think Python: How to Think Like a Computer Scientist”, 2<sup>nd</sup>edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016(<http://greenteapress.com/wp/think-python/>)
5. Robert Sedgewick, Kevin Wayne, Robert Dondero, “Introduction toProgramming in Python: An Inter-disciplinary Approach”, Pearson IndiaEducation Services Pvt. Ltd., 2016.

<b>Course Code</b>	<b>CORE PRACTICAL – IV Numerical Methods with C++ Programming Lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213SEC42L</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>3</b>

**Aim:**

- To develop programming skills of Numerical Methods with C++ programming in solving some mathematical problems and their applications.

**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 2<sup>nd</sup> order method.
10. Solution of ordinary differential equations – Runge – Kutta 4<sup>th</sup> order method.

<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-IV NANO SCIENCE AND TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213DSC43A</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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 – Ball millig – Application of nanomaterials – Insulation materials – Machines tools–Phosphors – Batteries – 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 – purification of carbon nanotubes – The properties of nanotubes – Conductivity – Strength and elasticity – 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 - Refractive index – nanoholes and photons – Imaging – New low cost energy efficient windows in solar absorbers, base on nanoparticles – Nanometals – Nanotechnology and day night – Solar cells, nanoparticles and nanostructure – Optically use full nanostructured polymers – Polymeric crystals, surface wave guides and control of light paths.

**UNIT – V: NANO ELECTRONICS & 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 – Carbon nanotube transistors Molecular electronics –DNA – Directed assembly and application in electronics – Quantum Information and quantum computers – Nan

machines and nano elasticity – nanoparticle coating – special new effects – 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.



<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-IV NON-LINEAR DYNAMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19213DSC43B</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**Aim:**

- To learn the basic principles and working of linear and nonlinear systems with the applications.

**UNIT – I: Linear And Nonlinear Systems**

Linear and non linear forces – Non linear dynamical systems – Effects of non linearity – Phase space – Liouville theorem – Solution of damped and forced linear oscillator – Resonance phenomenon – Duffin oscillator – Jump phenomenon.

**UNIT – II: Fixed Points And Stability Analysis**

Stable and unstable fixed points – Classification of fixed points in first and second order systems – Limits cycle motion – Bifurcations; Saddle node, Pitchfork, Transcritical and Hopf bifurcations.

**UNIT – III: Bifurcation And Chaos**

Logistic map: Stability of period – 1 and 2 fixed points – Period doubling phenomenon – Onset of chaos – Bifurcation diagram – Different routes to chaos: Period doubling quasiperiodic route and intermittency route – Necessary conditions for chaos.

**UNIT – IV: Fractals**

Self-similarity – Self similarity in Henon attractor – Properties of fractals – Examples of fractals – Fractal dimension – Construction and properties of middle – Third cantor set, Koch curve and sierpinski triangle.

**UNIT – V: Solution And Integrability**

Complete integrability of finite dimensional systems – Painleve analysis to deduct integrability – Linear and non linear waves – Conoidal and solitary waves – John Scott Russel's observation of solitary waves – K–dv equation – Fermi – Pasta Ulam problem – Numerical experiment of Zabusky and Kruskal – Soliton – Lax pair – Inverse scattering transform method for K–dv equation – Other solution equations – Applications.

**Books for Study and Reference:**

1. M. Lakshmanan and S. Rajasekar, Nonlinear Dynamics: Integrability Chaos and Patterns (Springer-verlag, Berlin, 2003).

2. E. Ott. Chaos in Dynamical Systems (Cambridge University Press Cambridge, 1993).
3. H. G. Schuster: Diterministic Chaos (Verlag, Weintein, 1988).
4. H. O. Peiten, P. H. Richter, The Beauty of Fractals (Springer, Berlin, 1986).
5. P. G. Drazin and R. S. Johnson, Solitons: (Cambridge University Press, Cambridge, 1985).
6. M. J. Ablowitz and P. E. Clarkson, solution, non linear Evolution Equation and Inverse Scattering (Cambridge University Press, Cambridge, 1991).

## **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 (Physics) curriculum, the following Research Skill Based Courses are introduced in the curriculum.

<b>Semester</b>	<b>RSB Courses</b>	<b>Credits</b>
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 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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SCHOOL OF ARTS AND SCIENCE

M.Phil PHYSICS-SYLLABUS – REGULATION 2019

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
193PHC11	Research Methodology	2	2	0	4
193PHC12	Advanced Physics	2	2	0	5
193PHC13	Crystal Growth Methods And Characterization Techniques	2	2	0	5
CPE_RPE	Research Publication Ethics	2	2	0	2
	<b>TOTAL</b>				<b>16</b>
<b>SEMESTER II</b>					
	Project				<b>10</b>
	<b>TOTAL</b>				<b>10</b>

## **M Phil- SYLLABUS**

**(For the candidates admitted from the academic year 2020-2021 onwards)**

### **PAPER – I RESEARCH METHODOLOGY (SUB.CODE: 193PHC11)**

**(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 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.

#### **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)

## **PAPER – II ADVANCED PHYSICS**

**(SUB.CODE: 193PHC12)**

### **Unit–I: Crystal Physics and Physical Properties of Crystals**

Representation of physical quantities by scalars, vectors and tensors – Tensors of second rank- Transformations of components of a second-rank tensor – Representation quadric – Simplification of equations referred to principal axes – Effect of crystal symmetry on crystal properties: Neumann's principle – Magnitude of a property in a given direction – Geometrical properties of the representation quadric – Equilibrium properties represented by second-rank tensor: Electric Polarization: relations between D, E and P in a parallel plate condenser – Stress tensor: homogeneous and inhomogeneous stresses – Strain tensor: homogeneous three-dimensional strain.

### **Unit–II: Crystal Optics and Non-Linear and Electro-Optical Effects in Crystals**

Double refraction: Optical indicatrix – Effect of crystal symmetry on optical indicatrix – Wave surface: Uniaxial and Biaxial crystals – Non-Linear Optics: Harmonic generation – Second Harmonic Generation – Phase matching – Third Harmonic Generation – Optical Mixing: Sum and difference frequencies – Parametric generation of light – Self-focusing of intense light beams – Electro-Optic Effect: Phase retardation – Longitudinal electro-optic modulators: Amplitude modulation – Phase modulation of light – Transverse electro-optic modulators – Electro-optic beam deflection.

### **Unit– III: Nanomaterials and their applications**

Properties of metallic and semiconducting Nanoparticles – various physical and chemical methods of preparation –self assembly and catalysis assisted growth methods - synthesis of carbon nanostructures and their applications –nanostructured ferromagnetism–size and dimensionality effects in nanostructures – biological application of nanomaterials.

### **Unit – IV: Surface analysis techniques**

Atomic Collision and Backscattering Spectrometry: – Energy loss of Light Ions and Backscattering Depth Profiles – Sputter Depth Profile and Secondary Ion Mass Spectroscopy – Channeling: Basics and its application in Thin Film analysis - X-ray Photoelectron Spectroscopy – Electron Microprobe analysis of surface – Nonradiative Transitions and Auger Electron Spectroscopy.

### **Unit – V: Spectroscopic methods**

Spectrophotometer – UV –VIS Near IR, - Basic concepts of FTIR and Raman and its applications to various materials - NMR and ESR and its applications – Thermal analysis (TG/DTA, DSC) of different Materials. X-ray Method The Bragg Law – X- ray Spectroscopy – Diffraction Directions – Diffraction Methods – Powder Method – Particle size Calculation – X ray scattering by electrons, atomic and unit cells.

### **Books for Study for**

1. 'Physical Properties of Crystals: Their Representation by Tensors and Matrices' by J.F. Nye, 1985, Oxford University Press, New York.
2. 'Lasers and Non-Linear Optics' by B.B. Laud, Chapter-13, Wiley Eastern Ltd., 1985,
3. 'Quantum Electronics' by Amnon Yariv, Chapter-14, John Wiley & Sons, Inc., 1975, New York.
4. Introduction to Nanotechnology by C.P Pool Jr. and F.J Owens, John Wiley & Sons
5. Nanostructures & Nanomaterials Synthesis, Properties and Applications by Guozhong Cao ( World Scientific Publishing)
6. Fundamentals of surface and thin film analysis – Leonard C. Feldman and James W. Mayer
7. Basic Principles of Spectroscopy – Raymond Chang, McGraw Hill International book company
8. Elements of x-Ray Diffraction (Second Edition) BD Cullity
9. Fundamentals of Molecular Spectroscopy by Banwell

## **PAPER–III CRYSTAL GROWTH METHODS AND CHARACTERIZATION TECHNIQUES**

**(SUB.CODE: 193PHC13)**

### **Unit I - Thermodynamics of Crystal Growth**

Saturation and super saturation – solubility curve – expression for super saturation–solubility diagram – nucleation – Theories of nucleation – Gibbs Thomson equation for vapour –Modified Thomson's equation for melt – Gibbs Thomson equation for solution – Kinetic of crystal growth– Single and rough faces – Models of surface roughness - KSU theory and BCF theory.

### **Unit II - Growth from solutions**

Low temperature solution growth: Slow cooling process – solvent evaporation process –Temperature difference process – Use of electrolytic process high temperature solution growth: Solvent & solutions - slow cooling methods – temperature difference methods – high pressure method – solvent evaporation method – electrolytic process - liquid phase epitaxial.

### **Unit III - Growth from melt**

Bridgeman and related techniques – crystal pulling – convection in melts – modeling and simulation of bulk crystal growth considering melt growth – czocharalski technique – zone melting technique – skull melting process – verneuil process-Heat exchange method.

### **Unit IV - Other Crystal Growth Techniques**

Physical vapour deposition-chemical vapour deposition – chemical vapour transport –definition – fundamentals – choice of transport reactions – specifications – Transported materials and agents-STP,LTVTP,OTP-Hydrothermal growth: Design aspect of autoclave-electro crystallization-Gel method: principle-types of gels-structure of gels-growth in gels-experimental procedure-biological crystallization.

### **Unit V - Analysis and Characterization of Crystals**

Optical transmission studies (UV) Micro hardness studies-Structural analysis-XRD-Fourier Transform-IR-Spectral analysis-Scanning Electron Microscope (SEM)-different etching techniques.

### **Books for Reference:**

1. Brice J.C, Crystal Growth Processes, John Wiley & sons , New York 1986,
2. Santhanaraghavan P, Ramasamy . P, Crystal Growth – Process and Methods, KRU Publications, Kumbakonam, 2000.
3. Buckley H.E, Crystal Growth, John Wiley & Sons, New York, 1986.
4. Gilman J, The Art of Science of Growing Crystals, John Wiley & Sons, New York, 1956.
5. William Kemp, Organic spectroscopy, 3 rd Edition, , Palgrave, New York, 2004.

## RESEARCH AND PUBLICATION ETHICS

Course Code	Course Title	L	T	P	C
CPE_RPE	Research and publication ethics	-	-	-	2

### UNIT I: PHILOSOPHY AND ETHICS

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

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

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

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

#### A. Group Discussions

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**

Use of plagiarism software like Turnitin, Urkund and other open source software tools.

**UNIT VI: DATABASES AND RESEARCH METRICS**

**A. Databases**

1. Indexing databases.
2. Citation database: Web of Science, Scopus etc.

**B. Research Metrics**

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score.
2. Metrics: h-index, g index, i10 index, altmetrics.



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## Mapping of courses to Employability/Entrepreneurship and Skill Development

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

B. Sc., Curriculum-Regulation 2019

Course Code	Course Title	L	T	P	C
19111AEC11	Advanced English-I	4	0	0	2

### 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

Skill development

### UNIT – IV

Editing

Proof reading

### UNIT – V

Comparison and contrast

Cause and effect

Course Code	Course Title	L	T	P	C
19111AEC12	English-I	4	0	0	2

**UNIT –I**

The Art of Reading

- Lin Yutang

An Eco-Feminist Vision

-Aruna Gnanadason

**UNIT – II**

The Merchant of Death

-Nanda Kishore Mishra &amp; 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

**Skill development****UNIT –IV**

Enterprise

-Nissim Ezekiel

Love poem for a wife

-A.K Ramanujam

**UNIT –V**

Oliver Twist

-Charles Dickens

Course Code	Course Title	L	T	P	C
19115AEC13	Biomolecules	6	1	0	5

**Unit I**

Carbohydrates – Definition, Biological significance, D and L designations, classification; Physical and chemical properties of monosaccharides; sugars – reducing and non-reducing sugars; Epimers and Mutarotation Structural elucidation of glucose and fructose; Structure and functions of Maltose, Lactose, Sucrose, Fructans, Starch, Cellulose, Chitin, Glycogen and Heparin. Blood group and bacterial cell wall polysaccharides.

**Unit II**

Amino acids – Protein and non-protein amino acids; Classification of amino acids based on structure, chemical properties and functions; Chemical reactions of amino acids.

Proteins – Peptides, peptide bond, solid phase peptide synthesis; Biological functions and classification; Primary structure of insulin; secondary structures – Helix, sheet and Turns; Tertiary structures of myoglobin; Quaternary structure of hemoglobin; Protein sequencing; structural stability of proteins.



### Unit III

Nucleic acids – Purine and pyrimidine bases; ribose and deoxy ribose sugars; Nucleosides and nucleotides; significances of nucleotides; Nucleic acids – DNA and RNA; DNA – Genetic material, Genome, C-value paradox; Double helical structure of DNA; A, B and Z forms of DNA; Sequencing of DNA by enzymatic method; Types of RNA and their biological roles; Differences between DNA and RNA.

### Unit IV

Lipids – Definition, classification, nomenclature, Properties and biological importance; Fatty acids and essential fatty acids; Structure of triglycerides – classification - Quality analysis of oils; Structures and functions of phospholipids, spingophospho lipids, steroids and prostaglandins. Types of lipoproteins and their significance.

### Unit V

Vitamins – Definition and classification; Natural sources, structures, biological roles and deficiency manifestations of Vitamins A, C, D, E, K and B complexes. Minerals – Macro and micro minerals (Na,K,Ca,Mg,P,Fe,Se,Zn,Cu,Mn) Antibiotics – Definition, types and general properties; Structure and significance of Penicillin and tetracycline.

### Skill development

Course Code	Course Title	L	T	P	C
19115AEC14L	Biomolecules Lab-I	0	0	3	2

#### 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.

## ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
19114AEC15	Chemistry - I	5	1	0	4

### UNIT- I

#### **Polar effect:**

Inductive effect

+I and – I groups, relative strength of – foamic , acetic and propionic acids – 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.

### SKILL DEVELOPMENT

#### 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.

Course Code	Course Title	L	T	P	C
19114AEC16L	Volumetric Analysis Lab	0	0	3	2

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

### SKILL DEVELOPMENT

#### Skill Based Elective-I MS-WORD

Course Code	Course Title	L	T	P	C
1920SEC01AL	Package Lab-I	0	0	2	1

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

### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19160SEC01B	Soft Skill I	0	0	2	1

## Part- I Effective Communication

### 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.

### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111SEC01 L	Communicative English Lab-I	0	0	1	1

**UNIT –I**

Noun

Pronoun

Adjective

**UNIT – II**

Verb

Adverb

**UNIT –III**

Conjunction

Preposition

Interjection

**UNIT – IV**

Kinds of Sentences

**UNIT –V**

Patterns of sentences

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
191INDCON S	Indian Constitution	0	0	0	0

**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.

### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111AEC21	Advanced English-II	4	0	0	2

#### 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

Course Code	Course Title	L	T	P	C
19111AEC22	English-II	4	0	0	2

#### UNIT – I

Ecology

Gift

The First Meeting

-A.K. Ramanujan

-Alice Walker

-Sujata Bhatt

#### UNIT –II

Fueled

Asleep

Buying and selling

-Marcie Hans

-Ernst Jandl

-Khalil Gibran

#### UNIT –III

The End of living and The Beginning of Survival

My Wood

The Meeting of Races

- Chief Seattle

- E.M.Forster

- Rabindranath Tagore

#### UNIT – IV

The Refugee  
I Have a Dream  
Those People Next Door

-K.A. Abbas  
-Martin Luther king  
-A.G. Gardiner

**UNIT – V**

Marriage is a private Affair  
The Fortune Teller  
Proposal

-Chinua Achebe  
-Karel Capek  
-Anton Chekov

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19115AEC23	Biochemical Techniques	6	1	0	5

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-Hasselbalch 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.

### EMPLOYABILITY

Course Code	Course Title	L	T	P	C
19115AEC24L	Biochemical Technique Lab-I	0	0	3	2

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.

### EMPLOYABILITY/ ENTREPRENEURSHIP

Course Code	Course Title	L	T	P	C
19114AEC25	Chemistry –II	5	0	0	5

### 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.

## SKILL DEVELOPMENT

## UNIT –V

### Surface chemistry:

Emulsion, gels preparation, properties and applications. Electrophoresis, Chromatography – Column, paper and thin layer chromatography.

Course Code	Course Title	L	T	P	C
19114AEC26L	Organic Analysis Lab	0	0	3	2

A study of elemental analysis of the following compounds:

- Carbohydrates,
- 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.

#### SKILL DEVELOPMENT

#### Skill Based Elective-II MS-EXCEL

Course Code	Course Title	L	T	P	C
19120SEC02AL	Package Lab-II	0	0	2	1

1. Prepare the addressing methods in excel
2. Describe the type of function
3. Draw a graph by using your own data
4. Prepare an Individual Pay Bill preparation for a employee in an organization.
5. Prepare a Mark list preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare a Inventory Preparation
8. Prepare a Electricity Bill Preparation

#### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19160SEC02B	SOFT SKILL - II	0	0	2	1

## Part -II Self Development

### 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

#### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111SEC02L	Communicative English Lab-II	0	0	1	1

### UNIT –I

Auxiliaries

### UNIT –II

Modals

### UNIT –III

Tenses-Simple, Perfect

### UNIT –IV

Tenses-Continuous, Perfect continuous

### UNIT –V

Articles

Participle

#### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111AEC31	Advanced English-III	4	0	0	2

### 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**

Course Code	Course Title	L	T	P	C
19111AEC32	English-III	4	0	0	2

**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**

Course Code	Course Title	L	T	P	C
19115AEC33	Cell Biology and Genetics	5	0	0	5

## 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.

### **SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19115AEC34L	Cell Biology and Genetics Lab-I	0	0	3	2

1. Separation of Carbohydrates by Ascending, Decending, Circular & Two Dimensional Paper Chromatography.
2. Separation of Amino acids by TLC method.
3. Separation of Lipids by TLC.
4. Separation of Plant pigments by Column Chromatography.

5. Separation of Serum protein by Paper Electrophoresis.

**EMPLOYABILITY**

Course Code	Course Title	L	T	P	C
19120AEC3 5	Programming in C	5	1	0	5

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.

**SKILL DEVELOPMENT**

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

Course Code	Course Title	L	T	P	C
19120AEC36 L	Programming in C lab	0	0	3	2

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

Course Code	Course Title	L	T	P	C
19115RMC37	Research Methodology	2	0	0	2

#### 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.**

### SKILL DEVELOPMENT

#### Skill Based Elective-III

#### POWER POINT

Course Code	Course Title	L	T	P	C
19120SEC03AL	Package Lab-III	0	0	2	1

1. Create a slideshow 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 slideshow 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 slideshow 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 slideshow presentation for a shop advertisement to be open shortly*
6. Create a slideshow 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 slideshow presentation for a tourists places
8. Create a slide for calendar using appropriate text attributes and insert an object from a bitmap file

### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19160SEC03B	SOFT SKILL III	0	0	2	1



## Part -III Interpersonal Relations and Social Responsibilities

### 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.

#### SKILL DEVELOPMENT

Course Code	Course Title	L	T	P	C
19111SEC03L	Communicative English Lab-III	0	0	1	1

### 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

Course Code	Course Title	L	T	P	C
19111AEC41	Advanced English-IV	4	0	0	2

### 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

Course Code	Course Title	L	T	P	C
19111AEC42	English-IV	4	0	0	2

#### 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

Course Code	Course Title	L	T	P	C
19115AEC43	Human Physiology	5	0	0	4

#### 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**

Course Code	Course Title	L	T	P	C
19115AEC44L	Biochemical Techniques Lab-II	0	0	3	2

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**

Course Code	Course Title	L	T	P	C
19120AEC4 5	Fundamentals of Computing	6	0	0	5

**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**

Course Code	Course Title	L	T	P	C
19120AEC46L	WEB DESIGN LAB	0	0	3	2

1. Create a Web page for ABC INFOTECH LTD., with necessary images and marquee.

2. Create Web pages which display 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 wherever applicable)
7. Create a Web page which receives suggestions from customers for a software development & consultancy agency using necessary.

### **sKILL DEVELOPMENT**

#### **Skill Based Elective IV MS-ACCESS**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04AL	Package Lab-IV	0	0	2	1

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the universality exams
3. Create a database for sorting the date of joining by the employee in the organization.
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 employee database

### **sKILL DEVELOPMENT**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19160SEC04B	SOFT SKILL IV	0	0	2	1

#### **PART -IV Etiquette And Interviewing Skills**

#### **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.

**sKILL DEVELOPMENT**

**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	Course Title	L	T	P	C
19111SEC04 L	Communicative English lab -IV	0	0	1	1

**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**

**ENVIRONMENTAL STUDIES  
(for undergraduate students)**

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	2	0	0	2

**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.

### 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).

## SKILL DEVELOPMENT

### 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 an individual in prevention of pollution.

## SKILL DEVELOPMENT

### 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 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.

Course Code	Course Title	L	T	P	C
19115AEC51	Enzymes	5	0	0	4

### 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. Metalloenzymes 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 – Menten 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**

Course Code	Course Title	L	T	P	C
19115AEC52	Bioenergetics and Metabolism	5	0	0	3

#### **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 – (CoA,  $\beta$ ) – 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

Course Code	Course Title	L	T	P	C
19115AEC53	Immunology	4	1	0	4

### 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 alternative 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.

#### Employability/Entrepreneurship/Skill development

### Unit IV

Serological Techniques- Antigen – Antibody reactions -characteristics – Precipitation – types – immunodiffusion – Immunolectrophoresis - 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.

Course Code	Course Title	L	T	P	C
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19115AEC54L	Food and Enzyme Analysis Lab	0	0	3	2
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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. Km (Saturation Method).
10. Determination of Salivary Amylase Activity.
  - a. Effect of PH
  - b. Effect of Temperature.
  - c. Specific Activity
  - d. Km (Saturation Method).

#### Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19115AEC55L	Immunology Lab	0	0	3	2

#### 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

#### Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
19115DSC56A	Pharmaceutical Biochemistry	5	0	0	3

#### 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 importants of Xenpbiotic 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 effects – Toxic effects – Poisoning – Intolerance – Idiosyncrasy – Drug allergy – Photosensitivity – Drug addiction – Drug abuse – Drug withdrawl reactions – Teratogenicity. Biochemical Mechanism of Drug resistance. Toxicity assessment- acute, subchronic, chronic exposure, determination of ED<sub>50</sub> and LD<sub>50</sub> 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**

Course Code	Course Title	L	T	P	C
19115DSC56B	Basic Biotechnology	5	0	0	3

**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.

**Employability**

**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.

**SKILL BASED ELECTIVE - V**

**PHOTO SHOP**

Course Code	Course Title	L	T	P	C
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19120SEC05AL	Package Lab -V	0	0	2	1
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1. Design a Visiting card.
2. Design an Identity card.
3. Design a letterhead with LOGO.
4. Create an advertisement for Newspaper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

#### Skill development

Course Code	Course Title	L	T	P	C
19160SEC05B	SOFT SKILL V	0	0	2	1

### PART -V Leadership Skills and Body Language

#### 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

#### Skill development

Course Code	Course Title	L	T	P	C
19111SEC05L	Communicative English Lab -V	0	0	1	1

#### UNIT –1

Correct the spelling mistakes

Comprehension

**UNIT –II**

Find the odd one out

Picture description

**UNIT –III**

Abbreviations

Note making

**UNIT –IV**

Gender

Dialogue writing

**UNIT –V**

Acronyms

Concord

**Skill development**

**SEMESTER VI**

Course Code	Course Title	L	T	P	C
19115AEC61	Clinical Biochemistry	5	0	0	4

**Unit 1**

Gastric function tests- hyper, hypo and achlorhydria. Liver function tests. Jaundice hemolytic, hepatic and obstructive jaundice. Renal function tests. Biochemical findings in nephritic 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 the 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**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19115SEC62	Molecular Biology	5	0	0	5

#### **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. ) 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

Course Code	Course Title	L	T	P	C
19115AEC63L	Hematology and Clinical Biochemistry Lab	0	0	3	2

### 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 Dipyrityl Method
5. Estimation of Urea by DAM Method
6. Estimation of Uric Acid by Caraway's Method
7. Estimation of Calcium by Clark and Collip Method
8. Estimation of Bilirubin by Malloy and Evelyn Method

### Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19115SEC64L	Molecular biology Lab	0	0	3	2

#### 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

Course code	Course Title	L	T	P	C
19115DSC65A	Biochemistry of Plants and Microbes	5	0	0	3

#### Unit I

Photosynthesis: Photosynthetic pigments and photosynthetic apparatus. Light Reaction, Hill Reaction. Emerson effect. Dark Reaction – CO<sub>2</sub> fixation in C<sub>3</sub>,C<sub>4</sub>, 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

Course Code	Course Title	L	T	P	C
19115DSC65B	Hospital Management	4	0	0	4

## HOSPITAL MANAGEMENT

**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-Telemedicine-Health Tourism-Health Insurance and Managed Care-Disaster Management-Hospital Wastes Management.

### Employability

Course Code	Course Title	L	T	P	C
191ENOC-	Open Elective - Journalism	4	0	0	2

**Aim :**

- To acquaint with the basic knowledge of journalism so that it may enthrust 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

Skill development

**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
191MAOE C-	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

## SKILL DEVELOPMENT

### References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, "Operations Research"

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.

#### **SKILL DEVELOPMENT**

#### **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.

Sawhney – Dhanpat Rai and Sons – 1990.

Electronic Measurements And Instrumentation – Oliver Cage – McGraw Hill –1975.

Course Code	Course Title	L	T	P	C
191CEOEC-	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 the role of consumers.

**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 agents, sweeteners, humectants and anti -caking agents, coloring and flavoring substances.

**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**

**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
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 applications 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.

## **SKILL DEVELOPMENT**

### **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
191CAOEC	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 markup 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.

**SKILL DEVELOPMENT**

**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
191CMOEC	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.

**Course 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.

**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

**SKILL DEVELOPMENT****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-Padmalatha Suresh,Justin paul .

## Mapping of courses to Employability/Entrepreneurship and Skill Development

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF BIOCHEMISTRY

M. Sc., Curriculum-Regulation 2019

Course Code	Course Title	L	T	P	C
19215SEC11	Biomolecules	6	1	0	5

## UNIT-I

Carbohydrates-Structure, properties, stability and biomedical importance of monosaccharides; significance of sugar derivatives-sugar acids, Deoxy sugars, Amino sugars, Sulphate derivatives, Phosphate derivatives, and Glycosides; Structural features of reducing and non-reducing sugars; Structures and significance of Fructans, Xylans, Galactans, Starch, Cellulose, Glycogen, Chitin, Heparin, Hyaluronic acid and Chondroitin-4-sulphate; Blood group and bacterial cell wall polysaccharides, Glycosylated proteins and glycoproteins.

## UNIT-II

Lipids-Structure and properties of fatty acids and glycerol. Structure and function of triglycerides, phospholipids, sphingolipids, cholesterol, Ergosterol, Bile acids, Cerebrosides, Gangliosides, prostaglandins, Thromboxanes and leukotrienes; structure and significance of lipid bilayer, micelles and liposomes, chemistry and functions of lipoproteins.

## UNIT-III

Proteins-Amino Acids-Classification, acid-base properties, and stereochemistry Non-protein amino acids and their biological roles; peptides- peptide bond, solid phase peptide synthesis, Ramachandran plot. proteins- classification and biological functions; protein structural orders; structures- super secondary structures- protein sequencing - N and C terminal analysis. protein folding - Folding and unfolding; protein disulfide isomerase and molecular chaperones; Implications of protein folding to medicinal chemistry.

## UNIT-IV

Nucleic acids - structure and chemistry of purines, pyrimidines and nucleotides; Double helical structure of DNA; stability of DNA - sugar puckering, base stacking and ionic interactions; Types of RNA and their biological significance.

## UNIT-V

Terpens - classification - isoprene rule - isolation - structural formula of Geraniol, 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.

## Employability

Course Code	Course Title	L	T	P	C
19215SEC12	Biochemical and instrumental Analysis	6	1	0	5

### 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 fingerprinting and DNA footprinting; Hybridization techniques; Chromosomes walking, Blotting techniques – Southern, Northern and Western blotting.

### Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215SEC13	Enzymology	6	1	0	4

#### 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-principal, turnover number-Coenzymes- Active site - investigation of active site structure, formation of ES complex.

#### UNIT-II

Enzyme inhibition and kinetics- Michaelis- Menten plot, linear transformation, line weaver- 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<sub>cat</sub>

#### UNIT-III

Enzyme regulation:General mechanism of enzyme regulation,allosteric regulation, feedback inhibition and feed forward stimulation, Enzyme repression, induction and degradation, control of enzymatic activity by products and substrates.

#### UNIT-IV

Mechanism of enzyme catalysis- Acid base catalysis, covalent catalysis,Mechanism of action of lysozyme, carboxypeptidase-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 Pharmaceutical industry, Leather industry, detergent industry and Food industry- Research, theraoeutic and clinical diagnosis.

Employability

Course Code	Course Title	L	T	P	C
19215SEC14L	Biochemical Techniques Lab - I	0	0	4	2

## 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 Phosphorus in body fluids by flame photometry.
6. Separation of amino acids and lipids by Thin layer chromatography.
7. SDS- PAGE of proteins.
8. Separation of proteins by Size –exclusion chromatography.

## Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215DSC15A	Biostatistics	5	0	0	4

## UNIT – I

Research – definition, importance and types – Literature survey – journals – types, abstracting and indexing journals – Internet and its applications-eMail – 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.

## **Employability**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19215DSC15B	Immunology	5	0	0	4

## **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 – Immunoelectrophoresis – EIA – ELISA – RIA – Immunohematology – Hybridoma Technology – Merits and Demerits – Production of Vaccines and their uses.

Production of antisera – Fractionation of leukocytes – 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 – Autoimmunity – Hypersensitivity – classification. Organ Transplantation – Graft rejection – mechanism – Tissue typing – immuno supporting drugs – Immunotherapy.

Employability

Course Code	Course Title	L	T	P	C
19215SEC21	Cellular Biochemistry	5	1	0	5

## UNIT I

### Cell & cell cycle

Cell structures- plant and animal cell structures, Types of tissues- Epithelium – Organization and its types. Bones, Cartilage structure. Extracellular 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-checkpoints 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- crosstalk 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- tumor suppressor genes- p53-Telomerase-anti cancer agents

Employability/Skill development

Course Code	Course Title	L	T	P	C
19215SEC22	Metabolism and Regulation	5	1	0	5

## 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 substrates -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 cholesterol-Bile acids -lipoprotein metabolism.

## UNIT-IV

### NITROGEN METABOLISM

Nitrogen balance -Oxidative and NonOxidative deamination -Transamination - And Deamination -decarboxylation -Biogenic amines -Ureogenesis and regulation. Essential and nonessential amino acids - Ketogenic and glucogenic 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.

Employability/Skill development

Course Code	Course Title	L	T	P	C
19215SEC23	<b>Neuro Biochemistry</b>	5	0	0	4

## 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. Acetylcholine, 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.

Employability/Skill development

### **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 IV**

#### **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

Course Code	Course Title	L	T	P	C
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19215SEC24L	Enzymology Lab- II	0	0	4	2
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### 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 phosphatase and amylase – catalyzed reactions.
3. Effect of PH and Temperature on enzyme activity of urease and alkaline phosphatase.
4. Determination of activation energy and Km 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.

Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215DSC25A	Endocrinology	5	0	0	4

### UNIT: I

Hormones in general - definition – types of secretions – nature – classification synthesis and their role – Feedback 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

Gastrointestinal 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/Skill development

Course Code	Course Title	L	T	P	C
19215DSC25B	Clinical nutrition and dietetics	5	0	0	4

#### 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, etiology treatment.

(b) Underweight – definition, etiology, treatment.

(c)Diet in febrile conditions- typhoid, tuberculosis.

(d)Diebetes 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 nephritic syndrome.

#### Employability/Skill development

#### 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.

Course Code	Course Title	L	T	P	C
19215DSC25C	Bioinformatics	5	0	0	4

#### 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, database management systems and data base security; biological data bases - sequence databases 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 Entrez.

## 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 matriees; phylogenetics - phylogenetic trees; sequence annotation, Markov models for data base similarity searches.

## Employability/Skill development

## 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 - combinatorial chemistry and docking;

DNA microarrays - Methodology, types and applications - Goals of human genome project- structural and functional genome - Agroinformatics - Medical informatics - Metabolomics - E-cell.

Course Code	Course Title	L	T	P	C
19215RMC26	Research Methodology	3	0	0	2

## **UNIT I:**

Selection of problem-stages in the execution of research: choosing a topic to publish- 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. Radiochemical methods – Basic concepts, counting methods and applications. Autoradiography, detection and measurement of radioactivity, applications of radioisotopes in biology.

Employability/Entrepreneurship/Skill development

Code	Course Title	L	T	P	C
19215SEC31	Molecular Biology	6	1	0	6

## 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 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/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215SEC32	Clinical Biochemistry	6	1	0	6

### UNIT-I

Disorder of blood –Sickle cell disease - hereditary methemoglobinemia-Thalassemiias-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 diseasaes , 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 diseasaes – 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 ellilson syndrome – gallstones

### 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.

Employability/Skill development

Course Code	Course Title	L	T	P	C
19215SEC33L	Clinical Biochemistry Lab	0	0	5	3

### 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/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215DSC34A	Genetics and Genetic Engineering	5	0	0	4

### UNIT- I

Overview of genetics; relation between genes and traits; mendelian genetics –three postulates- dihybrid cross-test cross-punnett square-trihybrid cross-pedigree analysis-linkage-complete and incomplete linkage- crossing over-four crossing over-recombination frequencies-gene mapping in eukaryotes.

Sex determination – sex chromosomes- klinefelter and turner's 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- termination 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 emryos.

#### 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.

Employability/Skill development

Course Code	Course Title	L	T	P	C
19215DSC34B	Pharmaceutical Biotechnology	5	0	0	4

**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 (Penicillin, 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 somatotropin.

Employability/Skill development

Course Code	Course Title	L	T	P	C
19215SEC41	Molecular Basis of diseases	6	0	0	6

**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  $\beta$ -lactamases (ESBL) and implications on public health, molecular mechanisms for Tuberculosis, Typhoid, Cholera.

Employability/Skill development

## 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.

Course Code	Course Title	L	T	P	C
19215SEC42	Environmental Biochemistry	6	1	0	6

## UNIT I

Definition, scope and importance. Concept of an ecosystem. Structure and functions of the ecosystem. Producers, consumers and decomposers. Energy flows 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, Bioleaching,

## 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. Hotspots 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.

## Employability/Skill development

## UNIT V



Pollution Control: Cleaner technologies, reducing environment impact of industrial effluents, chemical pesticides, herbicides and fertilizers. Renewable source of energy through waste materials; biogas, energy crops, cellulose current levels of biodiversity and gene banks.

Course Code	Course Title	L	T	P	C
19215SEC43L	Molecular and Environmental Biochemistry lab	0	0	5	3

### 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

Employability/Entrepreneurship/Skill development

Course Code	Course Title	L	T	P	C
19215DSC44A	Medical Biotechnology	5	0	0	4

### 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.

Employability/Skill development

## **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;

## **REFERENCE**

Course Code	Course Title	L	T	P	C
19215DSC44A	Applied Microbial Biochemistry	5	0	0	4

**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.

**Employability/Skill development**

**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. Antibioqram. 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 acid).

Employability/Skill development



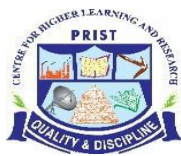
**PRIST**  
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NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMILNADU

# **SCHOOL OF ARTS AND SCIENCE**

## **DEPARTMENT OF BIOTECHNOLOGY**

### **B.Sc. BIOTECHNOLOGY CURRICULUM**

#### **REGULATION 2019**



**SCHOOL OF ARTS AND SCIENCE**

**DEPARTMENT OF BIOTECHNOLOGY**

**B.Sc., CURRICULUM - REGULATION-2019**

**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 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 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 assess basic research tool

### **B.Sc., Biotechnology (C)**

- C1- Fundamentals of Biological System
- C2- Fundamentals of Biological System Lab
- C3- Biological Chemistry
- C4- Biological Chemistry Lab
- C5- Cell Biology and Genetics
- C6- Cell Biology and Genetics Lab
- C7- Microbiology
- C8- Microbiology Lab
- C9- Research LED Seminar
- C10- Plant Physiology
- C11- Plant Physiology Lab
- C12- Immunology
- C13- Immunology Lab

- C14- Research Methodology
- C15- Animal Physiology
- C16- Animal Physiology Lab
- C17- Bioinformatics and Biostatistics
- C18- Bioinformatics and Biostatistics Lab
- C19- Development Biology
- C20- Cell and Tissue Culture
- C21- Enzyme and Enzyme Technology
- C22- Development Biology, Tissue Culture Lab
- C23- Enzyme and Enzyme Technology Lab
- C24- Discipline Specific Elective
- C25- Plant and animal Biotechnology
- C26- Applied Biotechnology
- C27- Plant, Animal and Applied Biotechnology Lab
- C28- Environmental Biotechnology Lab
- C29- Discipline Specific Elective
- C30- Package lab- I-VI
- C31- Communicative English Lab I-VI

B.Sc., Curriculum Mapping

**Programme Educational objectives Vs Programme Outcome**

Programme Outcome PO Programme specific outcome PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
PSO1	*	*		*	*	*	*
PSO2			*		*	*	*
PSO3	*	*	*		*		
PSO4	*	*	*			*	*
PSO5	*		*	*	*		*



## B.Sc. Biotechnology Curriculum Mapping

### Programme Outcome Vs Course Outcome

Programme Outcome- PO Courses Outcome-CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1	*	*	*	*	*	*	*
CO2	*	*	*	*	*	*	*
CO3	*	*	*	*	*	*	*
CO4	*	*	*	*	*	*	*
CO5	*	*	*	*	*	*	*
CO6	*	*	*	*	*	*	*
CO7				*	*	*	*
CO8	*	*	*	*	*	*	*
CO9				*	*	*	*
CO10	*	*	*	*	*	*	*
CO11			*	*	*	*	*
CO12	*	*	*	*	*	*	*
CO13	*	*	*	*	*	*	*
CO14	*	*	*	*	*	*	*
CO15	*	*	*	*	*	*	*
CO16	*	*	*	*	*	*	*
CO17	*	*	*	*	*	*	*
CO18	*	*	*	*	*	*	*
CO19	*	*	*	*	*	*	*

CO20				*	*	*	*
CO21	*	*	*	*	*	*	*
CO22				*	*	*	*
CO23	*	*	*	*	*	*	*
CO24			*	*	*	*	*
CO25	*	*	*	*	*	*	*
CO26	*	*	*	*	*	*	*
CO27	*	*	*	*	*	*	*
CO28	*	*	*	*	*	*	*
CO29	*	*	*	*	*	*	*
CO30	*	*	*	*	*	*	*
CO31	*	*	*	*	*	*	*



**SCHOOL OF ARTS AND SCIENCE**

**B. Sc., BIOTECHNOLOGY REGULATION- 2019**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19110AEC11/ 19111AEC11/ 19132AEC11/ 19135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I)	4	0	0	2
19111AEC12	English-I	4	0	0	2
19117AEC13	Fundamentals of Biological System	6	0	0	4
19117AEC14L	Fundamentals of Biological System Lab	0	0	3	2
19115AEC15A	Biological Chemistry	6	1	0	5
19115AEC16AL	Biological Chemistry Lab	0	0	3	2
191__SEC01__	Skill Based Elective-I	0	0	2	1
19111SEC01L	Communicative English Lab-I	0	0	1	1
191INDCONS	Indian Constitution	-	-	-	-
	<b>Total</b>	<b>20</b>	<b>1</b>	<b>9</b>	<b>19</b>
<b>SEMESTER II</b>					
19110AEC21/ 19111AEC21/ 19132AEC21/ 19135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
19111AEC22	English-II	4	0	0	2
19117AEC23	Cell Biology and Genetics	6	1	0	4
19117AEC24L	Cell Biology and Genetics Lab	0	0	3	2
19116AEC25	Microbiology	6	0	0	5
19116AEC26L	Microbiology Lab	0	0	3	2
19117RLC27	Research LED Seminar	-	-	-	1
191__SEC02__	Skill Based Elective -II	0	0	2	1
19111SEC02L	Communicative English Lab-II	0	0	1	1
	<b>Total</b>	<b>20</b>	<b>1</b>	<b>09</b>	<b>20</b>
<b>SEMESTER III</b>					

19110AEC31/ 19111AEC31/ 19132AEC31/ 19135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
19111AEC32	English-III	4	0	0	2
19117AEC33	Plant Physiology	5	0	0	4
19117AEC34L	Plant Physiology Lab	0	0	3	2
19117AEC35	Immunology	5	1	0	5
19117AEC36L	Immunology Lab	0	0	3	2
19117RMC37	Research Methodology	2	0	0	2
191__SEC03	Skill based Elective- III	0	0	2	1
19111SEC03L	Communicative English Lab-III	0	0	1	1
	<b>Total</b>	<b>20</b>	<b>1</b>	<b>09</b>	<b>21</b>
	<b>SEMESTER IV</b>				
19110AEC41/ 19111AEC41/ 19132AEC41/ 19135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
19111AEC42	English-IV	4	0	0	2
19117AEC43	Animal Physiology	5	0	0	4
19117AEC44L	Animal Physiology Lab	0	0	3	2
19117AEC45	Bioinformatics and Biostatistics	6	0	0	5
19117AEC46L	Bioinformatics and Biostatistics Lab	0	0	3	2
191__SEC04	Skill based Elective- IV	0	0	2	1
19111SEC04L	Communicative English Lab-IV	0	0	1	1
191ENVTSTU	Environmental Studies	2	0	0	2
	<b>Total</b>	<b>21</b>	<b>0</b>	<b>9</b>	<b>21</b>
	<b>SEMESTER V</b>				
19117AEC51	Development Biology	5	0	0	4
19117SEC52	Cell and Tissue Culture	5	0	0	3
19117AEC53	Enzyme and Enzyme Technology	4	1	0	4
19117AEC54L	Development Biology, Tissue Culture Lab	0	0	3	2
19117AEC55L	Enzyme and Enzyme Technology Lab	0	0	3	2
19117DSC56__	Discipline Specific Elective –I	5	0	0	3
19117BRC57	Participation in Bounded Research	-	-	-	1
191__SEC05	Skill Based Elective –V	0	0	2	1
19111SEC05L	Communicative English Lab – V	0	0	1	1
	<b>Total</b>	<b>19</b>	<b>1</b>	<b>9</b>	<b>21</b>
	<b>SEMESTER VI</b>				
19117AEC61	Plant and animal Biotechnology	5	0	0	4

19117SEC62	Applied Biotechnology	5	0	0	5
19117SEC63L	Plant, Animal and Applied Biotechnology Lab	0	0	3	2
19117AEC64L	Environmental Biotechnology Lab	0	0	3	2
19117DSC65_	Discipline Specific Elective - II	5	0	0	3
19117PRW67	Project Work	-	-	-	4
191__SEC06__	Skill Based Elective –VI	0	0	2	1
19111SEC06L	Communicative English Lab-VI	0	0	1	1
19117EXACT	Extension Activities	-	-	-	-
19117PEE	Programme Exit Examination	-	-	-	1
	<b>Total</b>	<b>19</b>	<b>0</b>	<b>9</b>	<b>25</b>
	<b>Total Credits for the Programme</b>				<b>127</b>

### Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 19117DSC56A - rDNA Technology b) 19117DSC56B - Molecular Biology
	Discipline Specific Elective Courses-II
VI	a) 19117DSC65A- Environmental Biotechnology b) 19117DSC65B- Environmental Management

### Open Electives

Semester	Open Elective Courses
VI	a) 19110OEC-Tamil Ilakiya varalaru b) 19111OEC-Journalism c) 19112OEC-Development of Mathematical Skills d) 19113OEC-Instrumentation e) 19114OEC-Food and Adulteration f) 19120OEC-E-Learning g) 19122OEC-Web Technology h) 19161OEC-Banking services

### Skill based Electives

Semester	Skill based Elective Courses
I	a) 19120SEC01AL-Package Lab – I b) 19160SEC01B-Soft skill – I
II	a) 19120SEC02AL-Package Lab – II b) 19160SEC02B-Soft skill – II
III	a) 19120SEC03AL-Package Lab –III b) 19160SEC03B-Soft skill – III
IV	a) 19120SEC04AL-Package Lab –IV b) 19160SEC04B-Soft skill – IV
V	a) 19120SEC05AL-Package Lab –V b) 19160SEC05B-Soft skill - V
VI	a) 19120SEC06AL-Package Lab –VI b) 19160SEC06B-Soft skill – VI

### Credit Distribution

Sem	AEC	SEC	DSC	GEC	Research	Others	Total
I	17	2	-	-	-	-	19
II	17	2	-	-	1	-	20
III	17	2	-	-	2	-	21
IV	17	2	-	-	-	2	21
V	12	5	3	-	1	-	21
VI	06	9	3	2	4	1	25
Total	<b>86</b>	<b>22</b>	<b>6</b>	<b>2</b>	<b>08</b>	<b>3</b>	<b>127</b>

SEMESTER - 1

Semester	Subject Code	Title of the Course
1	19110AEC11	<b>இக்கால</b> <b>இலக்கியம்,செய்யுள்,சிறுகதை,இலக்கணம்,இல</b> <b>க்கிய வரலாறுமனப்பாடப்பகுதி</b>

முதல் பருவம் - தாள் - 1

அலகு - I

**பாரதியார் தேசபக்திப் பாடல்கள்**

- கதந்திரப் பெருமை
- கதந்திரப் பயிர்
- கதந்திர தேவியின் துதி
- தொண்டு செய்யும் அடிமை

**பாரதிதாசன்**

- விரத்தாய்

அலகு -II

**சுதா** - நல்ல திர்ப்பு

**கண்ணதாசன்** - கத்தல் துணியின் கதை

**பட்டுக்கோட்டை கல்பாணசுத்தரம்** - நண்டு செய்த தொண்டு - காலம் சரியில்லே

**மு.மேத்தா** - வாழையடி வாழை

**வாலி** - தாய்

அலகு - III

**சிறுகதை** - இளவேளிற் குழிப்புகள் - திருவையாறு பாலகுமார்

அலகு - IV

**இலக்கணம்**

**எழுத்து**

மனப்பாடப்பகுதி

அலகு - V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை,புதுக்கவிதை

Course Code	Course Title	L	T	P	C
19111AEC11	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 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
19111AEC12	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

**SKILL DEVELOPMENT**

**References: -**

The Art of Reading/ Experiencing Poetry.

-S.Murugesan and Dr.K.Chellappan  
Emerald Publishers

Course Code	Course Title	L	T	P	C
19117AEC13	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 biology
- Appreciate the different scales of biological systems
- To understand the Basics in life sciences, evolution and organization of life, living non-living things
- To understand the basics of biomolecules, carbohydrates, proteins, lipids and Nucleic acids

**UNIT – I**

Basics in life science: definition of Biology- evolution and organization of life- living and non-living things- prokaryotes and eukaryotes- basis of classification of microbes, plants and animals up to order with 2 examples and salient features- nomenclature.

**SKILL DEVELOPMENT**

**UNIT II**

Inorganic perspective of life: atoms molecules, chemical reactions and concept of equilibrium, colligative properties of solution, laws of thermodynamics, bonding, water and its significance, pH maintenance- acids and bases.

**UNIT III**

Introduction to biomolecules: carbohydrates, proteins, lipids and Nucleic acids- classification- general properties- functions

#### **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

#### **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 2<sup>nd</sup> edition, George H. Fried and George J. Hademenos, Tata MacGraw Hill Publishers.

Course Code	Course Title	L	T	P	C
19117AEC14L	Fundamentals of Biological system Lab	0	0	3	3

**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
- To know the cellular organization of life, cell theory- cell organization-cell organelles- plant and animal cell
- To understanding the basic fundamentals of Biological System

**EX:**

- 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

**SKILL DEVELOPMENT**

**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
19115AEC15	Biological Chemistry	5	0	0	5

**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
- They study the influence and role of structure in reactivity of biomolecules
- Through this course the students are exposed to importance of biological macromolecules

**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.

**SKILL DEVELOPMENT**

#### **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
19115AEC16L	Biological Chemistry Lab	0	0	3	3

**Aim:**

- To understanding 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:**

- Students will use current biochemical and molecular techniques to plan and carry out experiments.
- Biochemistry Majors will gain proficiency in basic laboratory techniques in both chemistry and biology, and be able to apply the scientific method to the processes of experimentation and hypothesis testing
- At the end of the course, the students have a thorough understanding on the role of biomolecules and their functions

**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

**SKILL DEVELOPMENT**

**REFERENCES:**

- Biochemical methods II Edition Sadasivam, A. and Manickam, A. New age international P ltd. Publishers.

**Skill Based Elective-I  
MS-WORD**

Course Code	Course Title	L	T	P	C
19120SEC01AL	Package Lab-I	0	0	2	1

**OUTCOME:**

- Recognize when to use each of the Microsoft Office programs to create professional and academic documents
- Use Microsoft Office programs to create personal, academic and business documents following current professional and/or industry standards.
- Apply skills and concepts for basic use of computer hardware, software, networks, and the Internet in the workplace and in future coursework as identified by the internationally accepted Internet and Computing Core (IC3) standards.

**EX:**

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	Course Title	L	T	P	C
19160SEC01B	Soft Skill I	0	0	2	1

**Outcome:**

- Make effective communication

**Part- I Effective Communication**

**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	Course Title	L	T	P	C
19111SEC01L	Communicative English lab –I	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
- Enrich vocabulary
- Understand the process of communication
- Develop listening skill

**UNIT –I**

Noun

Pronoun

Adjective

**UNIT – II**

Verb

Adverb

**UNIT –III**

Conjunction

Preposition

Interjection

**UNIT – IV**

Kinds of Sentences

**UNIT –V**

Patterns of sentences

**References: -**

A Practical English Grammar  
English Grammar

-A.J Thomson and A.V.Martinet  
-Wren and Martin

Course Code	Course Title	L	T	P	C
191INDCONS	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

To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

**Outcome:**

- Democratic values and citizenship Training are gained
- Awareness on Fundamental Rights are established
- Learn the functions of union and State Governments
- Learn the power and functions of the Judiciary
- Appreciate 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 a 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

## SEMESTER – II

Semester	Subject Code	Title of the Course
II	19110AEC21	செய்யுள் - பக்தி இலக்கியம், சிற்றிலக்கியம், இலக்கணம், இலக்கிய வரலாறு மனப்பாடப்பகுதி

### அலகு-I

திருஞானசம்பந்தர் தேவாரம் - இடரினும் தளரினும் - பதிகம்  
திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை - பதிகம்  
திருவாசகம் - கோயிற் திருப்பதிகம்  
திருமத்திரம் - 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  
சிற்றிலக்கியம்.பள்ளு  
பிள்ளைத்தமிழ்  
பரவி

Course Code	Course Title	L	T	P	C
19111AEC21	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

**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
19111AEC22	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:**

- Appreciate different forms of literature
- Acquire language skills through literature
- Broadens 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

**References:-**

Gathered Wisdom

-GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
19117AEC23	Cell biology and genetics	6	1	0	6

**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 work is fundamental to living systems.
- The course outcome is to train the students in understanding genetics and relate modern DNA technology for disease diagnostics and therapy
- Students will be taught Mendelian genetics, their principles and gene interaction.
- This gives them a strong foundation on the basic unit of life.

**UNIT I**

Genetics- History, genetics in society and biology, fundamental concept of genetics-

Mendelian genetics: Monohybrid cross, dihybridcross, testcross, backcross

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-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



## **SKILL DEVELOPMENT**

### **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, 4<sup>th</sup> Edn, 2012 W.H. Freeman and ccompany

Molecular biology of the cell by bruce alberts, Alexander johnson, julian lewis, David morgan, martin raff, keith Roberts,peter walter, 6<sup>th</sup> edn, 2015, garland science.

Genetics: Amolecular approach by peter j. Russell. 3<sup>rd</sup> edn, 2010, person 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
19117AEC24L	Cell biology and genetics Lab	0	0	3	2

**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:**

- Able to isolate the DNA, identify and distinguish different blood cells, to solve simple genetic problems and analyze Human karyotype
- The course teaches the students about genes at molecular level
- They learn about DNA, RNA and their replication, mutations, DNA repair mechanism

**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

**ENTREPRENEURSHIP**

**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
19116AEC25	Microbiology	5	0	0	5

**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:**

- This fundamental paper discusses the importance of microorganisms
- The course throws light on types of microorganisms in and around humans
- At the end of the course, the student has understanding on the metabolism and mechanism of microbial life

**Unit I**

(12 Hrs)

Overview of history of Microbiology - Biogenesis and abiogenesis Contributions of Redi, Spallanzani, Needham, Pasteur, Tyndal, Joseph Lister, Koch [Germ Theory], Edward Jenner and Fleming [Penicillin], Scope of Microbiology. Classification of Microbes - Nutritional types [Definition and examples]. Classification on the basis of oxygen requirement.

**Unit II**

(12 Hrs)

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**

(12 Hrs)

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, antisepsis sterilants and fumigation.

**Unit IV** (12 Hrs)

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.

**SKILL DEVELOPMENT**

**Unit V** (12 Hrs)

Basic concepts of Virology - General characteristics of viruses, differences between bacteria and viruses. Classification of viruses. Ultrastructure of TMV and Bacteriophage.

**REFERENCE:**

- Microbiology M.J.Pelczar E.C.S.Chan and N.R.Crick. 2007.Mc Graw Hill

Course Code	Course Title	L	T	P	C
19116AEC26L	Microbiology lab	0	0	3	3

**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:**

- Develop basic skill in aseptic techniques
- Understand various accessories for microbiology practical's
- Perform various staining techniques
- Cultivate bacteria with different cultivation technique

**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 (Lacto phenol 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.

**Skill Based Elective-II  
MS-EXCEL**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC02AL	Package Lab-II	0	0	2	1

**Outcome:**

- Indicate the names and functions of the Excel interface components.
- Enter and edit data
- Format data and cells.
- Construct formulas, including the use of built-in functions, and relative and absolute references.
- Create and modify charts
- Preview and print worksheets.

**Ex**

1. Prepare the addressing methods in excel
2. Describe the type of function
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 preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare an Inventory Preparation
8. Prepare an Electricity Bill Preparation

**SKILL DEVELOPMENT**

Course Code	Course Title	L	T	P	C
19160SEC02B	SOFT SKILL II	0	0	2	1

### Part -II Self Development

#### Outcome:

Build self-development

#### 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	Course Title	L	T	P	C
19111SEC02L	Communicative English lab -II	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:**

- Learn grammar
- Use a variety of reading strategies
- Enhance the skill of making grammatically correct sentences.
- Achieve one's goal by following the ancestral path

**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

**SEMESTER – III**

Semester	Subject Code	Title of the Course
III	<b>19110AEC31</b>	<b>செய்யுள் - காப்பியங்கள்,இலக்கணம்,இலக்கிய வரலாறு,மனப்பாடப்பகுதி</b>

**அலகு-I**

சிலப்பதிகாரம்- வழக்குரை காதை  
மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை  
சீவகசிந்தாமணி - நாட்டுவளம் 10 பாடல்கள்

**அலகு-II**

பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம்  
கம்பராமாயணம் -வாலி வதைபடலம்

**அலகு-III**

சீறாட்புராணம் - கரம் பொருத்து படலம்  
இயேசுகாவியம் - மலைப்பொழிவு

**அலகு-IV**

இலக்கணம்- யாப்பு இலக்கணம்  
மனப்பாடப்பகுதி

**அலகு-V**

இலக்கிய வரலாறு  
காப்பியங்கள்  
ஐஞ்சிறுகாப்பியங்கள்  
புராணங்கள், இதிகாசங்கள்

Course Code	Course Title	L	T	P	C	Marks
19111AEC31	Advanced English-III	4	0	0	2	100

**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

**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
19111AEC32	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:**

- Enable to 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

**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
19117AEC33	Plant physiology	5	0	0	5

**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:**

- Impart an insight into the various plant water relations
- learning about the mineral nutrition in plants
- Understand the mechanism of various metabolic processes in plants
- Understand the respiration in higher plants with particular emphasis on aerobic and anaerobic respiration.

**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; CO<sub>2</sub> fixation - C<sub>3</sub>, C<sub>4</sub> 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.

#### **SKILL DEVELOPMENT**

#### **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
19117AEC34L	Plant physiology Lab	0	0	3	3

**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:**

- Equip students with skills and techniques related to plant physiology so that they can design their own experiments
- Learn about the movement of sap and absorption of water in plant body.
- Understand the plant movements

**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 CO<sub>2</sub> and light is essential for photosynthesis (Moll's half leaf experiment)

**SKILL DEVELOPMENT**

**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
19117AEC35	Immunology	4	0	0	4

**Aim:**

- To learn the immune system and reaction

**Objectives:**

- To expose the students with the immune system of human body

**Outcomes:**

- The students may understand the immune system, its components and various techniques used in bio manipulation.
- This course gives an overview on the immune system including organs, cells and receptors
- The students learn about molecular basis of antigen recognition, hypersensitivity reaction, antigen-antibody reactions
- The course develops in the student an appreciation for principles of immunology and its applications in treating human diseases

**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.

### **EMPLOYABILITY**

#### **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
19117AEC36L	Immunology Lab	0	0	3	3

**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:**

- Identify the structure, function, and characteristics of immunoglobulins.
- Explain the principles of and perform serological tests.
- It's a paper which accomplishes the learning of techniques involved in understanding the immunological aspects of physiology and biological samples

**EX:**

1. To determine total platelet count
2. To perform PT
3. To perform APTT
4. To perform thrombin time
5. Determination of hemoglobin by various methods.
6. Determination of Total RBC count.

**EMPLOYABILITY**

**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
19117RMC37	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 MATLAB platform for effective computational and graphic works required for quality research

**OUTCOME:**

- Understanding research questions and tools
- Experience in scientific writings
- Practice in various aspects of scientific publications
- Inculcation of research ethics

**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 life science 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.

### Skill Based Elective-III

Course Code	Course Title	L	T	P	C
19120SEC03AL	Package Lab-III	0	0	2	1

#### Outcome:

- Identify the names and functions of the PowerPoint interface.
- Create, edit, save, and print presentations
- Format presentations
- Add a graphic to a presentation.
- Create and manipulate simple slide shows with outlines and notes.
- Create slide presentations that include text, graphics, animation, and transitions

#### EX:

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 degrees
  - 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 a tourist's places
8. 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
19160SEC03B	SOFT SKILL III	0	0	2	1

### Part -III Interpersonal Relations and Social Responsibilities

**Outcome:**

- Learn interpersonal relations and social responsibilities.

**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	Course Title	L	T	P	C
19111SEC03L	Communicative English lab -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:**

- Learn grammar
- Enhance their fluency in English
- Develop speaking and writing skills
- Develop individual perspectives that demonstrate critical thinking skills

**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

**References: -**

A Practical English Grammar

English Grammar

Technical Communication

-A.J Thomson and A.V. Martinet

- Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma

SEMESTER – IV

Semester	Subject Code	Title of the Course
IV	17110AEC41	செய்யுள்- சங்க இலக்கியம்,இலக்கணம்,இலக்கிய வரலாறு- மனப்பாடப் பகுதி

அலகு-I

எட்டுத்தொகை  
நற்றிணை - 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 - முழுவதும்  
திருக்குறள்- ஐந்து அதிகாரம்-  
அறம் 2,பொருள் 2,இன்பம் -1 வான்சிறப்பு,அழகுகாறாமை,இறைமட்சி,கடாநட்டி,காதற்சிறப்பு,நரத்தல்

அலகு-IV  
இலக்கணம் அணி

மனப்பாடப்பகுதி

அலகு-V  
இலக்கிய வரலாறு  
எட்டுத்தொகை  
பத்துப்பாட்டு  
அறஇலக்கியங்கள்

Course Code	Course Title	L	T	P	C
19111AEC41	Advanced English-IV	4	0	0	2

**Aim:**

- To improve the knowledge of English

**Objective:**

- To familiarize with the objectives and types of interviews
- 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**

**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
19111AEC42	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:**

- Improve their ability to read and understand them
- Know the genius of Shakespeare
- Express in writing their views.

**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

Course Code	Course Title	L	T	P	C
19117AEC43	Animal physiology	6	0	0	6

**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
- understanding the more complicated structures and processes in mammals and humans
- It's a paper which accomplishes the learning of techniques involved in understanding the immunological aspects of physiology and biological samples.
- To know the importance of phagocytosis and natural killer cells in innate body defense.

**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): Nerve impulse 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

### **EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT**

### **UNIT V**

Homeostasis: Significance- mechanism of osmo-ion regulation in fresh water, estuarine and marine fishes.

### **REFERENCES:**

- Human Physiology, Stuart Fox, 11<sup>th</sup> ed., McGraw Hill
- Linda Costanzo's "Physiology- Board Review Series (5<sup>th</sup> Ed.)" Lippincott Williams & Wilkins.

Course Code	Course Title	L	T	P	C
19117AEC44L	Animal physiology Lab	0	0	3	3

**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 cardiorespiratory, renal, reproductive and metabolic systems
- It trains the students with essentiality of molecules, cells, tissues and organs involved in the defense mechanism

**EX:**

1. Microscopy
2. WBC count
3. Differential leucocyte count by Leishman's staining
4. Estimation of Hemoglobin by Sahli's acid haematin method
5. Determination of Packed cell volume (PCV)
6. Determination of Erythrocyte sedimentation rate (ESR)
7. Determination of Coagulation time & bleeding time
8. Determination of blood group
9. Determination of Blood Pressure by Sphygmomanometer

**EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT**

**REFERENCES**

G.K.Pal & P. Pal. 2006. Textbook of Practical Physiology. 2nd Edn. Orient Blackswan.

Course Code	Course Title	L	T	P	C
19117AEC45	Bioinformatics and Biostatistics	6	0	0	6

**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 computers- 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

**UNIT IV**

Applications of statistics in biology- measures of central tendency- mean, median and mode- measures of dispersion- standard deviation and standard error.

## **UNIT V**

Test of significance- student's t test, chi square test. Correlation and its types.

### **EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT**

#### **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
19117AEC46L	Bioinformatics and Biostatistics Lab	0	0	3	3

**Aim:**

- To enable students to learn the basics of Bioinformatics and Biostatistics techniques

**Objective:**

- To impart practical exposure upon Bioinformatics tools and databases.

**Outcome:**

- This laboratory course will prepare the students for various applications of bioinformatics in life science research.
- The student will be able to apply basic principles of biology, computer science and mathematics to address complex biological problems
- This course imparts the knowledge of basic statistical methods to solve problems

**EX:**

- Study of Internet resources- databases NCBI, EMBL, DDBJ
- Sequence analysis using BLAST
- Multiple Sequence alignment using CLUSTAL W
- Primer designing
- Mean, median and mode in biological samples- leaves
- Correlation analysis- length- weight relationship in fishes

**ENTREPRENEURSHIP**

**Skill Based Elective IV  
MS-ACCESS**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19120SEC04AL	Package Lab-IV	0	0	2	1

**Outcome:**

- Examine database concepts and explore the Microsoft Office Access environment.
- Design a simple database.
- Build a new database with related tables.
- Manage the data in a table
- Query a database using different methods.
- Design a form.
- Generate a report.
- Import and export data.

**EX:**

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the universality exams
3. Create a database for sorting the date of joining by the employee in the organization.
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 employee database



Course Code	Course Title	L	T	P	C
19160SEC04B	SOFT SKILL IV	0	0	2	1

### **PART -IV Etiquette and Interviewing Skills**

**Outcome:**

- Develop etiquette and interviewing skills.

#### **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 interviews (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	Course Title	L	T	P	C
19111SCE04L	Communicative English lab -IV	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:**

- Learn grammar
- Enable to express their views in conversation
- Develop soft skills
- Enhance presentation 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

**References: -**

A Practical English Grammar

English Grammar

Technical Communication

-A.JThomson and A.V. Martinet

-Wren and Martin

-Meenakshi Sharma & Sangeetha Sharma

# ENVIRONMENTAL STUDIES

(For under graduate students)

Course Code	Course Title	L	T	P	C
191ENVTSTU	Environmental Studies	1	0	0	1

## 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:

- Learn about environmental pollution.
- Familiarize with the social issues and the environment

## 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, dam's 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 none — 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.

### **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, and 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](mailto: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

## **SEMESTER V**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19117AEC51	Developmental biology	5	0	0	5

### **Aim:**

- Developmental biology studies the genetic control of cell growth, differentiation and "morphogenesis," which is the process that gives rise to tissues, organs and anatomy.

### **Objectives:**

- Understand the significance of nature using scientific methods.
- Understand the origin and evolution of biotic community

### **Outcomes:**

- Be able to list the types of characteristics that make an organism ideal for the study of developmental biology
- Be familiar with the events that led up to and comprise the process of fertilization.
- Be able to compare and contrast the process of gastrulation in the various model organisms discussed

### **UNIT-I:**

A brief historical account, microsporangium and male gametophyte-structure and development; incompatibility-types, mechanism and methods to overcome incompatibility. Megasporogenesis, development of female gametophyte (3 types).

### **UNIT-II:**

Organization and ultra-structure of mature embryo sac, nutrition. Fertilization - germination of pollen, path of pollen tube; Endosperm – types and function; embryogenesis-development of a typical monocot and dicot embryo, polyembryony

### **UNIT III**

Germ cell: structure of sperm and egg (human) - types of eggs- egg membranes- egg organization- role of pituitary and other related endocrines in gametogenesis

### **UNIT IV**

Fertilization: mechanics- physiology- theories and development- experimental work in fertilization- biochemical changes during fertilization.

## **UNIT-V**

Cleavage and gastrulation: General principles- outlines of physiology- comparative account in frog, chick and man- embryonic adaptations

### **EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT**

#### **REFERENCES:**

Balinsky- Text book of embryology

Nelson- comparative vertebrate embryology

Berril- Developmental Biology



Course Code	Course Title	L	T	P	C
19117SEC52	Cell and tissue culture	5	0	0	5

**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:**

- Fundamentals of plant tissue culture. Plant regeneration and organogenesis. Embryogenesis. Organ, anther and pollen culture. Ovary, ovule and embryo culture. Callus suspension culture.
- Protoplast, isolation, culture and fusion.
- Production of hybrids and cybrids.

**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 plantlet's- 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.

#### **EMPLOYABILITY/ENTREPRENEURSHIP/SKILL DEVELOPMENT**

#### **REFERENCES:**

- Plant tissue culture by Kalyan Kumar
- Animal Biotechnology by Ranga

Course Code	Course Title	L	T	P	C
19117AEC53	Enzyme and enzyme technology	4	1	0	3

**Aim:**

**Objectives:**

- To enable the students to understand in detail about the fundamentals of enzymes and their functions.

**Outcomes:**

- The course will provide an overview of the key enzymes currently used in large scale industrial processes
- This course includes the isolation, purification and characterization of enzymes and their applications
- Discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.

**UNIT I:**

General Properties of enzymes, Enzymes nomenclature and classification. Isolation, purification, and methods of assay of enzymes. Coenzymes and co-factors.

**UNIT II:**

Unit of activity, specific activity of enzyme – the active site, lock and key hypothesis – induced fit hypothesis and Strain or transition state stabilization. Mechanism of reaction catalyzed by chymotrypsin.

**UNIT III:**

General mechanism of enzyme regulation; Feedback inhibition and feed forward stimulation; Enzyme repression, induction and degradation; Control of enzymatic activity by products and substrates; Reversible and irreversible covalent modifications of enzymes.

**UNIT IV:**

Kinetics of enzyme – single substrate enzyme – Michaelis – Menton equation; Significance  $V_{max}$  and  $K_m$  value. Kinetics of Multi-substrate enzymes catalyzed reaction. Introduction to enzyme engineering and its applications. Allosteric enzymes and their significance.

### **Unit V:**

Clinical and Industrial application of enzymes. Immobilization of enzymes and their applications. Ribozyme and their applications. Enzyme as biosensors.

### **REFERENCES:**

- Mahler and Cordes (1986) Biological Chemistry
- Nicholes C. Price and Lewis Stevens. Fundamentals of Enzymology: OxfordUniv. Press.
- Alan Fersht, Enzyme Structure and mechanism: Reading, USA.
- K.J.Laider and P.S.Bunting, The chemical kinetics of enzyme action: Oxford University Press, London.

Course Code	Course Title	L	T	P	C
19117AEC54L	Developmental biology, tissue culture lab	0	0	3	3

**Aim:**

- Identify and describe the structural features of plants.
- Explain the mechanisms which lead to cell determination.

**Objectives:**

- Discuss the basic processes of plant metabolism, transport, nutrition, growth, and reproduction.
- Describe the evolutionary conservation of developmental mechanisms.

**Outcomes:**

- Demonstrate a basic understanding of developmental terms and mechanisms.
- Utilize laboratory techniques to design and carry-out experimental studies.
- Conservation of endangered plant species
- Molecular, pharmacological and biochemical investigations of different aspects of plant growth and development such as in vitro flowering.

**EX:**

- Preparation of sperm smear
- Morphometric of sperm and ovum
- Study of egg types, cleavage, blastula, gastrula stages of frog
- Isolation of protoplast
- Protoplast viability test
- Preparation of media
- Demonstration of surface sterilization of explant
- Callus culture
- Primary cell culture and maintenance of cell lines

**REFERENCES:**

Plant tissue culture manual, K. Linsey, 2007, Eastern book corporation.

Culture of Animal cells: a manual of basic techniques, R. Ian Freshney, 2000 Wiley-Liss Inc.

Course Code	Course Title	L	T	P	C
19117AEC55L	Enzyme and enzyme technology lab	0	0	3	3

**Aim:**

- To learn the enzyme character and enzyme reaction

**Objectives:**

- To make students familiar with principles of enzyme activity, analysis of enzyme on the immune system

**Outcomes:**

- Distinguish the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms
- Apply biochemical calculation for enzyme kinetics
- Compare methods for production, purification, characterization and immobilization of enzymes
- Discuss various application of enzymes that can benefit human life

**EX:**

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 cellulose

**REFERENCES:**

- K.J.Laider and P.S.Bunting, The chemical kinetics of enzyme action: Oxford University Press, London.
- Molecular cloning by Sam brooket *al.* volume-I

## Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
19117DSC56A	rDNA Technology	5	0	0	4

### 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:

- Utilize the knowledge on creation of a genomic library
- explain the significance of model organisms in recombinant DNA technology
- This course teaches rDNA technology techniques and their application in the field of genetic engineering They learn about plasmids, vectors and gain knowledge on the construction of c-DNA libraries

### UNIT I

Gene cloning: principle 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, biolistic, microinjection – liposome mediated gene transfer.

### UNIT III

Genetic transformation of prokaryotes- introduction of DNA into living cell- identification of recombinations- introduction of phage DNA into bacterial cells

Cloning vectors for higher plants and animals- cloning DNA sequence 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-PCRvariants- analysis of amplified product-c-DNAs, 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 cell.

### **REFERENCES:**

1. Biotechnology by U. Satyanarayana
2. Principles of gene manipulation by Old and primrose, Blackwell Scientific Publications
3. Molecular biotechnology: principles and applications of recombinant DNA. by Bernard R. glick, jack J. pasternak, and Cheryl L. patten. 4<sup>th</sup> edn. 2010. ASM press,
4. Gene cloning & DNA analysis- an introduction by T.A. brown, 7<sup>th</sup> edition, 2010. John Wiley Sons, ltd.



Course Code	Course Title	L	T	P	C
19117DSC56B	Molecular Biology	5	0	0	4

**Aim:**

- Apply problem-solving skills to biological problems and issues.

**Objectives:**

- To outline the microorganisms and their applications and thereby producing various products of industrial- and commercial uses.

**Outcomes:**

- Understand and apply the principles and techniques of molecular biology which prepares students for further education and/or employment in teaching, basic research, or the health professions
- Explain the concept of recombination, linkage mapping and elucidate the gene transfer mechanisms in prokaryotes and eukaryotes
- Know the terms and terminologies related to molecular biology and microbial

**UNIT I:**

DNA as the genetic material – RNA as a genetic material – genetic code.

**UNIT II:**

Organization and function of prokaryotic and eukaryotic genetic material, replication of DNA and RNA.

**UNIT III:**

DNA damage – mechanism of repair – excision repair, recombination repair, promoter, operator, terminator and attenuator.

**UNIT IV:**

Organization of chromosomes, specialized chromosomes, chromosome abnormalities, population genetics, gametic cell genetics, crossing over, Epistasis chromosome mapping, gene linkage, three point cross, tetrad analysis.

**UNIT V:**

Discovery of types and structure of plasmids natural and artificial plasmid transfer and their applications. Insertion sequence in prokaryotes. Transposable elements – discovery and characterization.

**REFERENCES:**

1. Microbial genetics by S.R. Maloy, J. Egronan and D. Friefelder (1994) Jones and BartlettPublishers.
2. Molecular genetics of Bacteria by J.W. Dale (1994) John wiley and sons.
3. Concepts of genetics by W.S. Klug and M.R. Cummings. Prentice Hall, 1997.
4. Introductions to Genetic Analysis by Coriffiths, Freeman and co., 1996.
5. Eckstein F, Lilley DM. 1996. Catalytic RNA. Springer – Verlag.
6. Fried berg EC., Walker CC. Siede W. 1995. DNA repair and mutagenesis. ASM Press.
7. Cardner EJ, Simmons MJ, Squstad DP, 1991. Principles of genetics. John wileyd sons.
8. Singer M, Berg P 1991. Genes and Genomes University science Books.

**Skill Based Elective V**  
**PHOTO SHOP**

<b>Course Code</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	<b>Marks</b>
<b>19120SEC05AL</b>	<b>Package Lab-V</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>100</b>

**Outcome:**

- work with the Photoshop workspace
- navigate images
- resize and crop images
- make and work with selections
- create new layers and perform other basic layer functions
- transform images

**EX:**

1. Design a Visiting card.
2. Design a Identity card.
3. Design a letter pad with LOGO.
4. Create an advertisement for Newspaper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

Course Code	Course Title	L	T	P	C
19160SEC05B	SOFT SKILL V	0	0	2	1

### **PART -V Leadership Skills and Body Language**

**Outcome:**

- Develop leadership skills and body language

**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	Course Title	L	T	P	C
19111SEC05L	Communicative English lab -V	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 corporate skills.
- Handle their day to day affairs well with their knowledge of language skills.
- Get a job

**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

**UNIT –V**

Acronyms

Concord

**References: -**

A Practical English Grammar

English Grammar

English Grammar and Composition

Technical Communication

-A.JThomson and A.V.Martinet

-Wren and Martin

-Radhakrishna Pillai

-Meenakshi Sharma & Sangeetha Sharma

## SEMESTER VI

Course Code	Course Title	L	T	P	C
19117AEC61	Plant and animal biotechnology	4	0	0	5

### 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:

- This course teaches organization and expression of plant and animal genome and
- plant and animal tissue culture
- Students learn about transgenic animal, their application in pharmaceutical industry, cloning and its importance.
- This course prepares the students in appreciating the its benefits and applications in biotechnological, pharmaceutical, medical and agricultural field

### 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 disease.

### UNIT – II

Agrobacterium and crown gall tumor, Ti and Ri plasmids, T-DNA, binary 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 regulatory sequences in plants.

### UNIT - III

Genetic engineering in plants. Pest transformation technique, pest and disease resistant plants. Benefits and transgenic technology, application of plant 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 characterization-current scenario of molecular diagnosis in various disease. Animal health and welfare

#### **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. 4<sup>th</sup> ed. 2010.ASM Press
- Genetic engineering in animals by A.Puller
- Applied molecular biotechnology edited by Muhammad sarwar khan, iqar ahmad khan and debmalaya barh.2016.2016 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 Hansjorg hauser, roland wagner (eds) 2015. Walter de gruyter gmbh, berlin

Course Code	Course Title	L	T	P	C
19117SEC62	Applied biotechnology	4	0	0	4

**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:**

- Evaluate and describe systems of product research, development, and production
- Analyze the potential for commercialization for innovations within the biotechnology industry
- The students will gain the basic knowledge of aquaculture and      Students will solve a variety of problems using creative thinking skills and analytical skills in the lab.

**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- vermicomposting- 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
19117SEC63L	Plant, animal and applied biotechnology lab	5	0	0	3

**Aim:**

- Students are able to understand History, 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*, *Rhizobium* sp, *Azotobactor*

**Outcomes:**

- The students should have knowledge on biotechnological analysis and the utilization of these knowledge about procedures and utilization of such knowledge to combine biotechnological methods to obtain analytical results
- The students will develop fundamental knowledge in Plant Molecular Biotechnology and its application in laboratory and industry settings.
- Describe mechanisms of plant pollination and differentiate between haploid and diploid cells and their role in sexual reproduction

**EX:**

1. Shoot induction from callus
2. Root induction from explant
3. Monoclonal antibody production.
4. Purification of Immunoglobulin's.
5. Sericulture preparation
6. Spawn preparation
7. Mushroom cultivation
8. Preparation of vermibeds
9. Collection and Identification of earthworm
10. 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.

Course Code	Course Title	L	T	P	C
19117AEC64L	Environmental biotechnology Lab	0	0	3	3

**Aim:**

- s

tudents are able to understand basic environmental Waste Treatment process

**Objectives:**

- Domestic waste water treatment, Classification of Waste water treatment
- Biodegradation-Concept, Biodegradation of hydrocarbon, Measurement of biodegradation

**Outcomes:**

- To present an overview of important environmental biotechnologies involved in treatment of pollutants and resource recovery
- The students will be able to demonstrate the use of environmental science principle in solving various environmental problems
- Describe the most commonly applied disinfection methods, and the steps typically involved in drinking water treatment process

**EX:**

- Isolation of airborne bio particles
- Estimation of total solids in effluent sample
- Soil analysis- pH, Chloride, Calcium, Magnesium, Phosphorous and Nitrate
- Portability of water
- Determination of BOD& COD

**REFERENCE:**

- Experiments in Microbiology, Plant Pathology, Tissue Culture and Mushroom production technology. K.R.Aneja. 2001. New age international (P) Ltd publishers.
- Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.

Course Code	Course Title	L	T	P	C
19117DSC65A	Environmental Biotechnology	4	0	0	4

**Aim:**

- students are able to understand

**Objectives:**

- Bioremediation – Characterization site for bioremediation, Types of bioremediations
- Biodegradation-Assimilation, Detoxification, Biotransformation, Factor Affecting

**Outcomes:**

- Biofuels: Advantages, Energy from biomass, Biogas, Bio hydrogen, Biosafety  
• Toxicity  
Bio magnification, Threshold Dose, Factor Affecting Toxicity.
- Students will gain about environmental pollutions, preventive measures.
- Explain the microbial processes and growth requirements underlying the activated sludge process, nitrification, denitrification, enhanced phosphorus removal, and anaerobic digestion

**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, and 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**

Bio pesticides and biofertilizers; their role in pest and nutrient Management; Worm culture

Solid Wastes: Sources and Management; Composition; Methane Production; Food, Feed and Fuel from Biomass

#### **UNIT: IV**

Degradation of Xenobiotic Compounds in Environment: Decay Behavior and Derivative Plasmids; Hydrocarbons; Substituted Hydrocarbons; Oil Pollution; Surfactants; Bioremediation of Contaminated Soils

#### **UNIT – V**

Global environmental problems: Ozone depletion, Greenhouse 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.  
McGraw Hill Publisher

Course Code	Course Title	L	T	P	C
19117DSC65B	Environmental Management	4	0	0	4

**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:**

- The students in the course are exposed to the diversity, function, ecological adaptation of microorganisms within the environment
- This course gives the importance of microbial life to key ecosystem process and teaches the role of biotechnology to address environmental issues

**UNIT-I**

Water pollution – sources & types of water pollution – physical, chemical & biological – effect of water pollution. Drinking water quality standards waste water treatment – primary, secondary, tertiary-water pollution prevention & control act – 1974.

**UNIT-II**

Air pollution –structure and composition of atmosphere – classification, sources & effects of air pollution – Acid rain –greenhouse effect – global warming – Ozone depletion.

**UNIT-III**

Prevention and control of air pollution particulate control – settling chamber, scrubber, bag filter, cyclones electrostatic precipitators. Gaseous emission control methods. Air pollution prevention and control Act 1981.

**UNIT-IV**

Soil Pollution – soil pollutants – types – sources, effects & Control. Noise Pollution – sources effects & Control.

**UNIT-V**

Government Agencies & Programs – The Tiwari committee – creation of NCEPC,  
Department of Environment & Forest – Function of State Pollution Control Board.

#### **REFERENCES**

1. Rao, M. N and H.V.N. Rao (1993) Air Pollution, Tata McGraw – Hill Publishing Company Limited. New Delhi.
2. Kudesia, V.P and Ritu Kudesia (1992) Water Pollution, Pragati Prakashan Publication, Meerut.
3. Sawyer, C. N., P.L McCarty and G.F. Perkin (1994) Chemistry for Environmental Engineers, II Edition. McGraw-Hill.
4. Sharma, B.K and H.Kaur (1994) Soil and Noise Pollution. Goel Publishing House, Meerut.
5. Kumarasawmy, K., A. Alagappa Moses and M. Vasanthy (2004) Environmental Studies (A Text Book for All under Graduate Students) Bharathidasan University Publications.



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 behavior 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 analyses the behavior 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 MultiMate – 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:**

1. A Course in Electrical and Electronic Measurements and Instrumentation – A.K. Sawhmey – Dhanpat Rai and Sons – 1990.
2. 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 legislator 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 principals 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, flavonoids.

**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 colors 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
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 markup 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 Behavior 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.

**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 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.

**SKILL BASED ELECTIVE- VI  
FLASH**

Course Code	Course Title	L	T	P	C
19120SEC06AL	Package Lab-VI	0	0	2	1

**Outcome:**

- Learn to create animated graphics and sound and interactivity.
- Can develop Website
- CD based presentations

**EX:**

1. Drawing and painting original art in flash.
2. Creating simple objects using flash.
3. Creating a frame-by-frame animation technique.
4. Develop a program for animation with motion Twenning.
5. Develop a program for animation with shape Twenning.
6. Develop a program for adding sound to your movies.
7. Create a simple Banner.
8. Create a simple animations techniques movie clip and graphic symbols

Course Code	Course Title	L	T	P	C
19160SEC06B	SOFT SKILL VI	0	0	2	1

**PART -VI Life Skills and Other Skills**

**Outcome:**

- Develop life skills and other skills

**UNIT I Life Skills**

**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	Course Title	L	T	P	C
19111SEC06L	Communicative English Lab - VI	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:**

- Apply study skills
- Widen creative thinking
- Be a good team worker
- Make them proficient in English

**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

**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



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SCHOOL ARTS AND SCIENCE

**DEPARTMENT OF BIOTECHNOLOGY**

**M.Sc., BIOTECHNOLOGY– REGULATION 2019**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19217AEC11	General Microbiology	6	1	0	5
19217AEC12	Molecular Genetics	6	1	0	5
19217AEC13	Biochemistry	6	1	0	4
19217SEC14L	Microbiology & Molecular Genetics - Lab	0	0	4	2
19217DSC15_	Discipline Specific Elective I	5	0	0	4
19217RLC16	Research Led Seminar	-	-	-	1
	<b>Total</b>	<b>23</b>	<b>3</b>	<b>4</b>	<b>21</b>
<b>SEMESTER II</b>					
19217AEC21	Cell & Molecular Biology	5	1	0	5
19217AEC22	Biophysics & Bioinformatics	5	1	0	5
19217AEC23	Industrial Biotechnology	5	0	0	4
19217SEC24L	Molecular Biology & Industrial Biotechnology - Lab	0	0	4	2
19217DSC25_	Discipline Specific Elective II	5	0	0	4
19217RMC26	Research Methodology	3	0	0	2
19217BRC27	Participation in Bounded Research	-	-	-	2
	<b>Total</b>	<b>23</b>	<b>2</b>	<b>4</b>	<b>24</b>
<b>SEMESTER III</b>					
19217AEC31	Genomics	6	1	0	6
19217AEC32	Proteomics	6	1	0	6
19217SEC33L	Genomic and Proteomics – Lab	0	0	5	3
19217DSC34_	Discipline Specific Elective III	5	0	0	4
192_OEC	Open Elective	4	0	0	3
19217SRC35	Design/Socio technical research	-	-	-	2
	<b>Total</b>	<b>21</b>	<b>2</b>	<b>5</b>	<b>24</b>
<b>SEMESTER IV</b>					
19217AEC41	Food technology	6	1	0	6
19217AEC42	Bio instrumentation	6	1	0	6
19217SEC43L	Food technology and Bio instrumentation lab	0	0	5	3

19217DSC44_	Discipline Specific Elective IV	5	0	0	4
19217PRW45	Project work	-	-	-	6
19217PEE	Programme Exit Examination	-	-	-	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>5</b>	<b>27</b>
	<b>Total Credits for the Programme</b>				<b>96</b>

### Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a)19217DSC15A- Immunology b)19217DSC15B- Biosafety and biodiversity
	Discipline specific Elective Courses-II
II	a)19217 DSC25A- Endocrinology b)19217 DSC25B- Bioethics and IPR
	Discipline specific Elective Courses-III
III	a)19217 DSC34A- Nanobiotechnology b)19217 DSC34B- Environmental biotechnology
	Discipline specific Elective Courses-IV
IV	a)19217 DSC44A- Gene therapy utilization pharmacology b)19217 DSC44B- Plant conservation & disaster management

### Open Electives

Semester	Open Elective Courses
III	a) 19211OEC-Writing for the media b) 19212OEC-Applicable Mathematics Techniques c) 19213OEC-Bio-medical Instrumentation d) 19214OEC-Green Chemistry e) 19220OEC-M-Marketing f) 19261OEC- Insurance services g) 19280OEC-Counselling Psychology

### Credit Distribution:

S.No	Sem	AEC	SEC	DSC	OEC	RSB	Others	Total
1.	I	14	2	4	-	1	-	21
2.	II	14	2	4	-	4	-	24
3.	III	12	3	4	3	2	-	24
4.	IV	12	3	4	-	6	2	27
<b>Total</b>		<b>52</b>	<b>10</b>	<b>16</b>	<b>3</b>	<b>13</b>	<b>2</b>	<b>96</b>



**PRIST**  
DEEMED TO BE  
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THANJAVUR – 613 403 - TAMILNADU

**SCHOOL ARTS AND SCIENCE**

**DEPARTMENT OF BIOTECHNOLOGY**

**M.Sc. BIOTECHNOLOGY CURRICULUM**

**REGULATION-2019**



**PRIST**  
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THANJAVUR – 613 403 - TAMILNADU  
SCHOOL ARSDTS AND SCIENCE

**DEPARTMENT OF BIOTECHNOLOGY**

**M.Sc., BIOTECHNOLOGY– REGULATION 2019**

**COURSE STRUCTURE**

Course Code	Course Title	L	T	P	C
<b>SEMESTER I</b>					
19217AEC11	General Microbiology	6	1	0	5
19217AEC12	Molecular Genetics	6	1	0	5
19217AEC13	Biochemistry	6	1	0	4
19217SEC14L	Microbiology & Molecular Genetics - Lab	0	0	4	2
19217DSC15_	Discipline Specific Elective I	5	0	0	4
19217RLC16	Research Led Seminar	-	-	-	1
	<b>Total</b>	<b>23</b>	<b>3</b>	<b>4</b>	<b>21</b>
<b>SEMESTER II</b>					
19217AEC21	Cell & Molecular Biology	5	1	0	5
19217AEC22	Biophysics & Bioinformatics	5	1	0	5
19217AEC23	Industrial Biotechnology	5	0	0	4
19217SEC24L	Molecular Biology & Industrial Biotechnology – Lab	0	0	4	2
19217DSC25_	Discipline Specific Elective II	5	0	0	4
19217RMC26	Research Methodology	3	0	0	2
19217BRC27	Participation in Bounded Research	-	-	-	2
	<b>Total</b>	<b>23</b>	<b>2</b>	<b>4</b>	<b>24</b>
<b>SEMESTER III</b>					
19217AEC31	Genomics	6	1	0	6
19217AEC32	Proteomics	6	1	0	6
19217SEC33L	Genomic and Proteomics - Lab	0	0	5	3
19217DSC34_	Discipline Specific Elective III	5	0	0	4
192_OEC	Open Elective	4	0	0	3
19217SRC35	Design/Socio technical research	-	-	-	2
	<b>Total</b>	<b>21</b>	<b>2</b>	<b>5</b>	<b>24</b>
<b>SEMESTER IV</b>					
19217AEC41	Food technology	6	1	0	6
19217AEC42	Bio instrumentation	6	1	0	6
19217SEC43L	Food technology and Bio instrumentation lab	0	0	5	3
19217DSC44_	Discipline Specific Elective IV	5	0	0	4



19217PRW45	Project work	-	-	-	6
19217PEE	Programme Exit Examination	-	-	-	2
	<b>Total</b>	<b>17</b>	<b>2</b>	<b>5</b>	<b>27</b>
	<b>Total Credits for the Programme</b>				<b>96</b>

### Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a)19217DSC15A- Immunology b)19217DSC15B- Biosafety and biodiversity
	Discipline specific Elective Courses-II
II	a)19217 DSC25A- Endocrinology b)19217 DSC25B- Bioethics and IPR
	Discipline specific Elective Courses-III
III	a)19217 DSC34A- Nano biotechnology b)19217 DSC34B- Environmental biotechnology
	Discipline specific Elective Courses-IV
IV	a)19217 DSC44A- Gene therapy utilization pharmacology b)19217 DSC44B- Plant conservation & disaster management

### Open Electives

Semester	Open Elective Courses
III	a) 19211OEC-Writing for the media b) 19212OEC-Applicable Mathematics Techniques c) 19213OEC-Bio-medical Instrumentation d) 19214OEC-Green Chemistry e) 19220OEC-M-Marketing f) 19261OEC- Insurance services g) 19280OEC-Counselling Psychology

### Credit Distribution:

S.No	Sem	AEC	SEC	DSC	OEC	RSB	Others	Total
1.	I	14	2	4	-	1	-	21
2.	II	14	2	4	-	4	-	24
3.	III	12	3	4	3	2	-	24
4.	IV	12	3	4	-	6	2	27
<b>Total</b>		<b>52</b>	<b>10</b>	<b>16</b>	<b>3</b>	<b>13</b>	<b>2</b>	<b>96</b>

<b>Course Code</b>	<b>GENERAL MICROBIOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC11</b>		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 polyphonic 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 soil, 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, organic acids, bioconversion process, microbial insecticides.

#### **Unit IV**

Biochemistry of Metabolism: Carbohydrates and energy metabolism – fermentation or glycolysis, TCA cycle and oxidative phosphorylation, ammonia metabolism. Biosynthesis of glutamate. Purine and pyrimidine biosynthesis. Synthesis of DNA and RNA. Biosynthesis of cell wall – Peptidoglycans 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, bio fouling and corrosion. Bacterial photosynthesis, symbiotic and non-symbiotic nitrogen fixation, antimicrobial agents – structure of antibiotics, antibacterial and antiviral (function & mechanism of action)

### **SKILL DEVELOPMENT**

#### **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 Mcgra Hill Publication
- Microbial Biotechnology – Alexander N. Glazer, Hiroshni-Kaido, W.H. Freemanand Co. 1995.
- Chemical Microbiology – Antony H. Rose, Butterworths, 3rd Edition, PlenumPress, 1976.

<b>Course Code</b>	<b>Molecular genetics</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC12</b>		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 epigenetic regulation.

### **Unit III**

DNA damage and repair DNA damage by UV, alkylating agents, cross linkers. Mechanisms of repair – photo activation, excision repair, recombination 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.

### **SKILL DEVELOPMENT**

#### **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. Cumm 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.

<b>Course Code</b>	<b>BIOCHEMISTRY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC13</b>		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 carbolic of hexoses the citric acid cycle. Oxidation of fatty acids. Oxidation of amino acids. Oxidative phosphorylation. Glyoxylate cycle, TCA cycle, Krebs cycle, Pentose Phosphate pathway. Nitrogen cycle. .

**Unit II**

Carbohydrate – types, structure and functions of carbohydrates, biosynthesis, lipid biosynthesis, C2, C3, C4 cycles. Biosynthesis of fatty acids and triacyl glycerol. Secondary metabolites – occurrence, classification and functions of phenolic, terpenes, flavonoids, alkaloids, saponins, glycosides. Applications of secondary metabolites in food, dairy, agricultural, cosmetics and pharmaceutical Industries.

**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.

## **SKILL DEVELOPMENT**

### **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

<b>Course Code</b>	<b>MICROBIOLOGY &amp; MOLECULAR GENETICS LAB</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217SEC14L</b>		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.

### **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

#### **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
19217DSC15A	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.

### **SKILL DEVELOPMENT**

## **Unit V**

The Immune system in Health & Disease, AIDS & other Immuno deficiencies, 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.

<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE BIOSAFETY AND BIODIVERSITY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217DSC15B</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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 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 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.

#### **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

#### **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,

<b>Course Code</b>	<b>CELL &amp; MOLECULAR BIOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC21</b>		<b>5</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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, tumor 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- $\beta$ , Hedgehog, Wnt, Notch-Delta, NF-Kb, 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.

## **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

### **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

<b>Course Code</b>	<b>BIOPHYSICS &amp; BIOINFORMATICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC22</b>		<b>5</b>	<b>1</b>	<b>0</b>	<b>5</b>

**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 mechanics 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 Bio informatics-scope and application characteristics of hardware and software. Types of computer, Bio- chips, and computer network sending and receiving e-mail. Internet browsing- searching biological articles information in internet.

### **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

### **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.

<b>Course Code</b>	<b>INDUSTRIAL BIOTECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC23</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

- 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 fermenter (Batch and continuous fermenter) 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).

#### **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

#### **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

#### **REFERENCES:**

- Industrial microbiology by J.H patel
- Industrial microbiology by G.H casida

<b>Course Code</b>	<b>MOLECULAR BIOLOGY &amp; INDUSTRIAL BIOTECHNOLOGY lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217SEC24L</b>		<b>0</b>	<b>0</b>	<b>4</b>	<b>2</b>

**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 international PVT. Publishers.
- Boyer R. Modern experimental biochemistry, III edition, Benjamin Cummings publishers.

<b>Course Code</b>	<b>ENDOCRINOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217DSC25A</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**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**

Hypothalamus 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.

**ENTREPRENEURSHIP**

**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
19217DSC25B	BIOETHICS AND IPR	5	0	0	4

**AIM:**

- 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 license , 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 license 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

### **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

## **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

### **.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



<b>Course Code</b>	<b>RESEARCH METHODOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217RMC26</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>2</b>

**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 realized through helping these students to develop the subject of their research, encourage the formation of higher level of trained intellectual ability, critical analysis, rigor, and independence of thought, foster individual judgment, 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**

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.

### **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, 3<sup>rd</sup> edition, 1998.
- Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2<sup>nd</sup> Edition 1999.
- Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3<sup>rd</sup> 1999.
- Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2<sup>nd</sup> edition, Pp 160, ISBN: 081208005
- Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plgrave Macmillan, Pp256. ISBN 1403905843

<b>Course Code</b>	<b>GENOMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC31</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>6</b>

**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 organization, 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 – Pyro sequencing – 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 – Software’s 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.**

### **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.

<b>Course Code</b>	<b>PROTEOMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC32</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>6</b>

**AIM:**

- To understand the proteins encoded 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

## SKILL DEVELOPMENT

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, Inc. 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,

<b>Course Code</b>	<b>Genomics &amp; Proteomics - lab</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217SEC33L</b>		<b>0</b>	<b>0</b>	<b>5</b>	<b>3</b>

**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
- Peptide Cutter - 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

**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.



<b>Course Code</b>	<b>DISCIPLINE SPECIFIC ELECTIVE COURSE-III NANOBIOTECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217DSC34A</b>		<b>5</b>	<b>0</b>	<b>0</b>	<b>4</b>

**AIM:**

- One of major applications of Nano science 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 Nano science 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., tumour 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.

**Unit-IV**

Synthesis and characterization of different classes of biomedical polymers their uses in pharmaceutical, cardiovascular ophthalmologic orthopaedic areas.

**EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

## **Unit-V**

Biosensors and Nano biotechnology principles used in construction of microelectronic devices sensors and macro mechanical structures. And their functioning, immunonanotechnology.

### **Text 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 COURSE-III	L	T	P	C
19217DSC34B	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 bio fertilizers 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
19211OEC	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
19212OEC	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
19213OEC	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 stimulation.

**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
19214OEC	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 catalysis synthesis of industrial chemicals by bacterial constructs - Future Trends.

**Unit IV - Green House Effect**

Greenhouse effect and Global Warming – Introduction - How the greenhouse effect is produced - Major sources of greenhouse gases - Emissions of CO<sub>2</sub> - Impact of greenhouse effect on global climate - Control and remedial measures of greenhouse 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
19220OEC	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
19261OEC	Open Elective-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.

**Outcome:**

- 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	Course Title	L	T	P	C
19280OEC	Open Elective-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

**Outcome:**

- 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

<b>Course Code</b>	<b>FOOD TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>19217AEC41</b>		<b>6</b>	<b>1</b>	<b>0</b>	<b>6</b>

- 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
19217AEC42	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 Bio techniques

**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



**Reference Books:**

- 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
19217SEC43L	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. Downstream 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 fermenter (Demo)
7. Visit to Distillery unit; alcohol production and pharmacological industries. Pasteur Institute (Field visit).
8. Isolation & identification microbes from spoiled food.
9. Production of yogurt, butter.
10. Antibiotic production by different strains of microbes (Theory).
11. Calculate BMI
12. Handling of Colorimeter and Spectrophotometer
13. Estimation of RNA by orcinol method.
14. Estimation of DNA by Diphenylamine method.
15. Paper chromatography for separations and detections of simple sugars and amino acids.
16. Separation of plant pigments by column chromatography.
17. Thin layer chromatography of amino acids.

**EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

**Reference book:**

- Laboratory Manual in Biochemistry by J. Jayaraman. New Age International Publishers. 2nd Edn. 1981.
- Stanbury, P.F., A. Whitaker and S.J. Hall. 1995. Principles of fermentation Technology, Pergamon, UK.

Course Code	Course Title	L	T	P	C
19217 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 principles 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

**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, Lenti virus, Adenovirus, Adeno associated 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

#### **SKILL DEVELOPMENT**

#### **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. Cumm Prentice Hall, 1997.
- Introduction of Genetic Analysis of Griffiths – Freeman Co., 1996.

Course Code	Course Title	L	T	P	C
19217 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

**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.

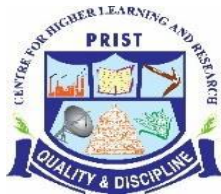
#### **UNIT V : Disaster Management**

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.

#### **EMPLOYABILITY/ ENTREPRENEURSHIP /SKILL DEVELOPMENT**

#### **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



**PRIST**  
DEEMED TO BE  
**UNIVERSITY**  
NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMILNADU

SCHOOL ARTS AND SCIENCE

DEPARTMENT OF BIOTECHNOLOGY

M.Phil., BIOTECHNOLOGY– REGULATION 2020

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
	<b>SEMESTER I</b>				
193BTC12	Advanced Biotechnology	6	1	0	5
193BTE13	Environmental Biotechnology	6	1	0	5





**PRIST UNIVERSITY**  
**VALLAM, THANJAVUR.**

**DEPARTMENT OF CIVIL ENGINEERING**

**PROGRAM HANDBOOK**

**B.TECH (CIVIL ENGINEERING-PART  
TIME)**

**[REGULATION 2019]**

**[for candidates admitted to B.Tech CE program from June 2019 onwards]**

## Program Educational Objectives

PEO1 To produce graduates who have developed the skills required to design Civil Engineering systems and facilities, including the graduate's abilities to formulate problems, to think creatively, to synthesize information, and to work collaboratively in teams.

PEO2 To produce graduates who are trained thoroughly in methods of analysis, including the mathematical and computational skills appropriate for Civil Engineers to use when problem solving.

PEO3 To produce graduates who are prepared for life-long learning and successful careers as Civil Engineers & also taught to use current, experimental and data analysis techniques for Civil Engineering applications.

### PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **The engineer and society:** An ability to develop the professional status using the broad education to understand the potential impact of Engineering solutions in various geographical settings including societal and environmental contexts.
6. **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.
7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
9. **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.

10. **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.
11. **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	Programme Outcomes										
	1	2	3	4	5	6	7	8	9	10	11
<b>PEO 1</b>	3	3	2	3	2	1	1	2	1	1	3
<b>PEO 2</b>	3	3	3	3	3	1	1	1	1	1	1
<b>PEO 3</b>	3	3	3	3	3	2	2	3	1	2	2

1-Reasonable: 2- Significant: 3- Strong

**B.Tech – CIVIL (PT)**

**CURRICULUM & COURSE  
STRUCTURE**

**2019R**

### SEMESTER – I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19148S11P	Transforms & Partial Differential Equations	3	1	0	4
2	19155C12P	Mechanics of Solids	3	1	0	4
3	19155C13P	Fluid Mechanics I	3	1	0	4
4	19155C14P	Surveying	3	1	0	4
5	19155C15P	Irrigation Engineering	3	0	0	3
TOTAL						19

### SEMESTER – II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19148S21P	Numerical Methods	3	1	0	4
2	19155C22P	Strength of Materials	3	1	0	4
3	19155C23P	Fluid Mechanics II	3	1	0	4
4	19155C24P	Concrete Technology	3	1	0	4
5	19155C25P	Soil Mechanics	3	0	0	3
TOTAL						19

### SEMESTER – III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19148S31P	Probability & Statistics	3	1	0	4
2	19155C32P	Design of Reinforced Concrete Structures-I	3	1	0	4
3	19155C33P	Structural Analysis I	3	1	0	4
4	19155C34P	Construction Materials And Practice	3	0	0	3
5	19155L35P	Soil Mechanics laboratory	0	0	3	2
TOTAL						17

### SEMESTER – IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155C41P	Design of Reinforced Concrete Structures-II	3	1	0	4
2	19155C42P	Structural Analysis II	3	1	0	4
3	19155C43P	Environmental Engineering	3	1	0	4
4	19155E44-P	Hard Core Elective I	3	1	0	4
5	19155L45P	Environmental Engineering Lab	0	0	3	2
TOTAL						18

**SEMESTER – V**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155C51P	Design of Steel Structures	3	1	0	4
2	19155C52P	Foundation Engineering	3	1	0	4
3	19155C53P	Industrial Waste Management	3	1	0	4
4	19155E54-P	Hard Core Elective II	3	1	0	4
5	19155L55P	Computer Aided Building Drawing Laboratory	0	0	3	2
TOTAL						18

**SEMESTER – VI**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155C61P	Estimation & Cost Evaluation	3	1	0	4
2	19155C62P	Ground Water Hydrology	3	1	0	4
3	19155C63P	Construction Project Management	3	1	0	4
4	19155E64-P	Hard Core Elective III	3	1	0	4
5	19155L65P	Concrete & Transportation Engineering Laboratory	0	0	3	2
TOTAL						18

**SEMESTER – VII**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19160S71P	Total Quality Management	3	0	0	3
2	19155C72P	Housing, Planning & Management	3	1	0	4
3	19155C73P	Repair And Rehabilitation of Structures	3	1	0	4
4	19155E74-P	Hard Core Elective IV	3	0	0	3
5	19155P75P	Project Work	1	1	12	6
TOTAL						20

**LIST OF ELECTIVES**  
**HARD CORE ELECTIVE I**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E44AP	Hydrology	3	1	0	4
2	19155E44BP	Water Resource Engineering	3	1	0	4
3	19155E44CP	Building Technology	3	1	0	4
4	19155E44DP	Contract Laws And Regulations	3	1	0	4

**HARD CORE ELECTIVE II**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E54AP	Computer Aided Analysis And Design	3	1	0	4
2	19155E54BP	Transportation Engineering	3	1	0	4
3	19155E54CP	Geology	3	1	0	4
4	19155E54DP	Highway Engineering	3	1	0	4

**HARD CORE ELECTIVE III**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E64AP	Remote Sensing And GIS	3	1	0	4
2	19155E64BP	Railway Engineering	3	1	0	4
3	19155E64CP	Airport & Harbours	3	1	0	4
4	19155E64DP	Electronic Surveying	3	1	0	4

**HARD CORE ELECTIVE IV**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E74AP	Air Pollution Management	3	0	0	3
2	19155E74BP	Pre Fabricated Structures	3	0	0	3
3	19155E74CP	Bridge Structures	3	0	0	3
4	19155E74DP	Pre stressed Concrete Structures	3	0	0	3

## **CREDIT DISTRIBUTION**

<b>S. No</b>	<b>SEMESTER</b>	<b>TOTAL CREDITS</b>
1	SEMESTER I	19
2	SEMESTER II	19
3	SEMESTER III	17
4	SEMESTER IV	18
5	SEMESTER V	18
6	SEMESTER VI	18
7	SEMESTER VII	20
Total Credits		129



## SEMESTER – I

### 19148S11P    TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

**L T P C**  
**3 1 0 4**

#### AIM & OBJECTIVES

The course objective is to develop the skills of the students in the areas of boundary value problems and transform techniques. 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 post graduate and specialized studies and research.

#### **UNIT-1      PARTIAL DIFFERENTIAL EQUATIONS      9**

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution 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.

#### **UNIT-II      FOURIER SERIES      9**

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 identify – Harmonic Analysis.

#### **UNIT-III      BOUNDARY VALUE PROBLEMS      9**

Classification of second order quasi linear partial differential equations – 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.

#### **UNIT-IV      FOURIER TRANSFORM      9**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.

#### **UNIT-V      Z -TRANSFORM AND DIFFERENCE EQUATIONS      9**

Z-transform - Elementary properties – Inverse Z – transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

**L: 45 T: 15**

**Total: 60 Periods**

#### **TEXT BOOKS**

1. Grewal, B.S., “Higher Engineering Mathematics”, Thirty Sixth Edition , Khanna Publishers, Delhi, 2005.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., “Engineering Mathematics Volume III”, S. Chand & Company Ltd., New Delhi, 2003.
3. T.Veera Rajan “Engineering Mathematics [For Semester III]. Third Edition.Tata McGraw-Hill Publishing Company. New Delhi,2007

#### **REFERENCES**

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Ramana B.V “ Higher Engineering Mathematics”, Tata McGraw – Hill Publishing Company.New Delhi,2007
3. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987

**UNIT I STRESS STRAIN AND DEFORMATION OF SOLIDS, STATES OF STRESS 9**

Rigid bodies and deformable solids – Stability – Strength – Stiffness – Tension, Compression and shear stresses – Strain – Elasticity – Hooke's law – Limit of proportionately, modulus of elasticity – stress-strain curve – lateral strain – temperature stresses – deformation of simple and compound bars – shear modulus – bulk modulus – relationship between elastic constants – biaxial state of stress – stress at a point – stress on inclined plane – principal stresses and principal planes – Mohr's circle of stresses.

**UNIT II ANALYSIS OF PLANE TRUSS, THIN CYLINDERS / SHELLS 9**

Stability and equilibrium of plane frames – Types of trusses – Analysis of forces in truss members – Method of joints – Method of sections – Method of tension coefficients – Thin cylinders and shells – Under internal pressure – Deformation of thin cylinders and shells.

**UNIT III TRANSVERSE LOADING ON BEAMS 9**

Beams statically determinate and indeterminate beams – Types of supports – Simple and fixed, types of loads – Concentrated – Uniformly distributed – Varying distributed load – Combination of above loading – Relationship between bending moment and shear force – Bending moment and shear force diagram for simply supported, cantilever and over hanging beams – Theory of simple bending – Analysis of stresses – Load carrying capacity of beams – Proportioning of sections

**UNIT IV DEFLECTION OF BEAMS AND SHEAR STRESSES 9**

Deflection of beams – Double integration method – Macaulay's method – Slope and deflection using moment area method – Conjugate Beam method – Variation of shear stress – Shear stress distribution in rectangular – Various sections.

**UNIT V TORSION AND SPRINGS 9**

Stresses and deformation in circular (solid and hollow shafts) – Stepped shafts – Shafts fixed at both ends – Leaf springs – Stresses in helical springs – Deflection of springs.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Egor P. Popov, "Engineering Mechanics of Solids", Prentice Hall of India, 2003.
2. Bansal, R.K., "Strength of Materials", Laxmi Publications, 2007.

**REFERENCES**

1. Subramanian, R., "Strength of Materials", Oxford university Press, 2005.
2. William A. Nash, "Theory and Problems of Strength of Materials, Schaum's Outline Series", Tata McGraw-Hill Publishing Co., 2007.
3. Srinath, L.S., "Advanced Mechanics of Solids", Tata McGraw-Hill Publishing Co., 2003.

**UNIT I DEFINITIONS AND FLUID PROPERTIES 10**

Definitions – Fluid and fluid mechanics – Dimensions and units – Fluid properties – Continuum Concept of system and control volume.

**UNIT II FLUID STATICS and KINEMATICS 10**

Pascal's Law and Hydrostatic equation – Forces on plane and curved surfaces – Buoyancy – Meta centre – Pressure measurement – Fluid mass under relative equilibrium Fluid Kinematics – Stream, streak and path lines – Classification of flows – Continuity equation (one, two and three dimensional forms) – Stream and potential functions – flow nets – Velocity measurement (Pitot tube, current meter, Hot wire and hot film anemometer, float technique, Laser Doppler velocimetry)

**UNIT III FLUID DYNAMICS 10**

Euler and Bernoulli's equations – Application of Bernoulli's equation – Discharge measurement – Laminar flows through pipes and between plates – Hagen Poiseuille equation – Turbulent flow – Darcy-Weisbach formula – Moody diagram – Momentum Principle.

**UNIT IV BOUNDARY LAYER AND FLOW THROUGH PIPES 10**

Definition of boundary layer – Thickness and classification – Displacement and momentum thickness – Development of laminar and turbulent flows in circular pipes – Major and minor losses of flow in pipes – Pipes in series and in parallel – Pipe network

**UNIT V SIMILITUDE AND MODEL STUDY 10**

Dimensional Analysis – Rayleigh's method – Buckingham's Pi-theorem – Similitude and models – Scale effect and distorted models.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Kumar, K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, 1995.
2. Rajput, R.K., "A text book of Fluid Mechanics", S.Chand and Co.,2007.

**REFERENCES**

1. John Finnemore, E. and Joseph B. Franzini, "Fluid Mechanics with Engineering Applications", McGraw-Hill International Edition, 2001
2. Pernard Messay, "Mechanics of Fluids" 7<sup>th</sup> Edition, Nelson Thornes Ltd. U. K. 1998.
3. Modi, P.N. and Seth, S.M ., "Hydraulics and fluid Mechanics", Standard bookhouse , 2005.

<b>UNIT I INTRODUCTION</b>	<b>8</b>
Definition – Principles – Classification –Chain Surveying– Ranging and chaining – Reciprocal ranging –Prismatic compass – Surveyor’s compass – Bearing – Systems and conversions – Localattraction – Magnetic declination – Dip – Traversing – Plotting – Adjustment of errors – Plane table instruments and accessories – Merits and demerits – Methods – Radiation – Intersection – Resection – Traversing.	
<b>UNIT II LEVELLING &amp; THEODOLITE SURVEYING</b>	<b>12</b>
Level line – Horizontal line – Levels and staves – Spirit level – Sensitiveness – Bench marks – Temporary and permanent adjustments – Fly and check leveling-- Theodolite surveying- Vernier and microptic – Description and uses — Horizontal angles – Vertical angles – Heights and distances – Traversing – Closing error and distribution .	
<b>UNIT III TACHEOMETRIC SURVEYING</b>	<b>6</b>
Tachometric systems – Tangential, stadia and subtense methods – Stadia systems – Horizontal and inclined sights – Vertical and normal staffing – Fixed and movable hairs – Stadia constants – Anallactic lens – Subtense bar.	
<b>UNIT IV CONTROL SURVEYING &amp; ASTRONOMICAL SURVEYING</b>	<b>9</b>
Triangulation –Signals – Base line – Instruments and accessories- Trigonometric leveling – Single and reciprocal observations - Astronomical surveying - Celestial sphere – Astronomical terms and definitions – Motion of sun and stars – Apparent altitude and corrections – Celestial co-ordinate systems – Different time systems – Nautical almanac – Star constellations – calculations for azimuth of a line.	
<b>UNIT V ENGINEERING SURVEYS</b>	<b>10</b>
Curve ranging – Horizontal and vertical curves – Simple curves – Setting with chain and tapes tangential angles by theodolite – Double theodolite – Basic concept of Compound and reverse curves – Transition curves .	

L: 45 T: 15

Total: 60 Periods

**TEXT BOOKS**

1. Bannister A. and Raymond S., “Surveying”, ELBS, 6<sup>th</sup> Edition, 1992.
2. Kanetkar T.P., “Surveying and Levelling”, Vol. I and II, United Book Corporation, Pune, 1994.

**REFERENCES**

1. Heribert Kahmen and Wolfgang Faig, “Surveying”, Walter de Gruyter, 1995.
2. James M. Anderson and Edward M. Mikhail, “Introduction to Surveying”, McGraw-Hill Book Company, 1985.
3. Punmia B.C., “Surveying”, Vol. I, II and III, Laxmi Publications, 2007

**UNIT I INTRODUCTION 12**

Irrigation – Need and mode of irrigation – Merits and demerits of irrigation – Crop and crop seasons – consumptive use of water – Duty – Factors affecting duty – Irrigation efficiencies – Planning and Development of irrigation projects.

**UNIT II IRRIGATION METHODS 10**

Canal irrigation – Lift irrigation – Tank irrigation – Flooding methods – Merits and demerits – Sprinkler irrigation – Drip irrigation.

**UNIT III DIVERSION AND IMPOUNDING STRUCTURES 14**

Weirs – elementary profile of a weir – weirs on pervious foundations – Types of impounding structures - Tanks, Sluices and Weirs – Gravity dams – Earth dams – Arch dams – Spillways – Factors affecting location and type of dams – Forces on a dam – Hydraulic design of dams.

**UNIT IV CANAL IRRIGATION 14**

Alignment of canals – Classification of canals – Canal drops – Hydraulic design of drops – Cross drainage works – Hydraulic design of cross drainage works – Canal Head works – Canal regulators – River Training works.

**UNIT V IRRIGATION WATER MANAGEMENT 10**

Need for leveling ion of water use – Minimising irrigation water losses – On farm development works – Percolation ponds – Participatory irrigation management – Water users associations – Changing paradigms in water management – Performance evaluation.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Asawa, G.L., “Irrigation Engineering”, New Age International Publishers, 2000
2. Punima B.C. & Pande B.B .lal Irrigation and water power engineering, laxmi publishing, New Delhi 2007.
3. Michael, A.M, Irrigation theory and practical, Vikas publishing Pvt Ltd, 2006
4. Gupta, B.L, & Amir Gupta, “Irrigation Engineering”, Satya Prahesan, New Delhi

**REFERENCES**

1. Dilip Kumar Majumdar, “Irrigation Water Management (Principles & Practices)”, Prentice Hall of India (P), Ltd, 2000.
2. Basak, N.N, “Irrigation Engineering”, Tata McGraw-Hill Publishing Co. New Delhi, 1999
3. Sharma R.K.. “Irrigation Engineering”, S.Chand & Co. 2007

## SEMESTER II

19148S21P

NUMERICAL METHODS

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### **UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9**

Linear interpolation methods (method of false position) – Newton’s method – Statement of fixed point theorem – Fixed point iteration:  $x=g(x)$  method – Solution of linear system by Gaussian elimination and Gauss-Jordan methods - Iterative methods: Gauss Jacobi and Gauss-Seidel methods - Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method.

### **UNIT II INTERPOLATION AND APPROXIMATION 9**

Lagrangian Polynomials – Divided differences – Interpolating with a cubic spline – Newton’s forward and backward difference formulas.

### **UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9**

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 – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpsons’s rules.

### **UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9**

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**

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.

**L: 45 T: 15**

**Total: 60 Periods**

#### **TEXT BOOKS**

1. C.F. Gerald and P.O. Wheatley, ‘Applied Numerical Analysis’, Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. E. Balagurusamy, ‘Numerical Methods’, Tata McGraw Hill Pub.Co.Ltd, New Delhi, 1999.

#### **REFERENCE BOOKS**

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, ‘Numerical Methods’, S.Chand Co. Ltd., New Delhi, 2003.
2. R.L. Burden and T.D. Faires, ‘Numerical Analysis’, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.

**UNIT I ENERGY PRINCIPLES****9**

Strain energy and strain energy density – Strain energy in traction, shear in flexure and torsion – Castigliano's theorems – Principle of virtual work – Application of energy theorems for computing deflections in beams and trusses – Maxwell's reciprocal theorems.

**UNIT II INDETERMINATE BEAMS****9**

Propped cantilever and fixed beams-fixed end moments and reactions for concentrated load (central, non central), uniformly distributed load, triangular load (maximum at centre and maximum at end) – Theorem of three moments – Analysis of continuous beams – shear force and bending moment diagrams for continuous beams – Slope deflections in continuous beams (qualitative study only)..

**UNIT III COLUMNS****9**

Eccentrically loaded short columns – Middle third rule – Core section – Columns of unsymmetrical sections – (angle channel sections) – Euler's theory of long columns – critical loads for prismatic columns with different end conditions – Rankine-Gordon formula for eccentrically loaded columns – Thick cylinders – Compound cylinders.

**UNIT IV STATE OF STRESS IN THREE DIMENSIONS****9**

Spherical and deviatoric components of stress tensor – Determination of principal stresses and principal planes – Volumetric strain – Dilatation and distortion – Theories of failure – Principal stress dilatation – Principal strain – Shear stress – Strain energy and distortion energy theories – Application in analysis of stress, load carrying capacity and design of members – Residual stresses.

**UNIT V ADVANCED TOPICS IN BENDING OF BEAMS****9**

Unsymmetrical bending of beams of symmetrical and unsymmetrical sections – Curved beams – Winkler Bach formula – Stress concentration – Shear flow – Center.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Popov, E.P., "Engineering Mechanics of Solids", Prentice Hall of India, 2003.
2. Rajput, R.K., "Strength of Materials", S. Chand and Company Ltd., 2006.

**REFERENCES**

1. Srinath, L.S., "Advanced Mechanics and Solids", Tata-McGraw Hill Publishing Company Ltd, 2005.
2. Punmia, B.C., "Theory of Structures (SMTS) Vol I and II", Laxmi Publishing Pvt Ltd, 2004.
3. Kazimi, S.M.A., "Solid Mechanics", Tata McGraw-Hill Publishing Co., 2003.

<b>UNIT I</b>	<b>OPEN CHANNEL FLOW</b>	<b>8</b>
	Open channel flow – Types and regimes of flow – Velocity distribution in open channel – Wide open channel – Specific energy – Critical flow and its computation.	
<b>UNIT II</b>	<b>UNIFORM FLOW</b>	<b>8</b>
	Uniform flow – Velocity measurement – Manning’s and Chezy’s formula – Determination of roughness coefficients – Determination of normal depth and velocity – Most economical sections – Non-erodible channels	
<b>UNIT III</b>	<b>VARIED FLOW</b>	<b>10</b>
	Dynamic equations of gradually varied flow – Assumptions – Characteristics of flow profiles – Draw down and back water curves – Profile determination – Graphical integration, direct step and standard step method – Flow through transitions - Hydraulic jump – Types – Energy dissipation – Surges – Surge channel transitions.	
<b>UNIT IV</b>	<b>TURBINES</b>	<b>10</b>
	Turbines - draft tube and cavitations – Application of momentum principle – Impact of jets on plane and curved plates - turbines - classification - radial flow turbines - axial flow turbines – Impulse and Reaction.	
<b>UNIT V</b>	<b>PUMPS</b>	<b>9</b>
	Centrifugal pump - minimum speed to start the pump – multistage Pumps – Jet and submersible pumps - Positive displacement pumps - reciprocating pump - negative slip - flow separation conditions - air vessels -indicator diagram and its variation - savings in work done - rotary pumps.	

L: 45 T: 15

Total: 60 Periods

**TEXT BOOKS**

1. Subramanya K., "Flow in Open channels", Tata McGraw-Hill Publishing Company, 1994.
2. Kumar K.L., "Engineering Fluid Mechanics", Eurasia Publishing House (P) Ltd., New Delhi, (7th Edition), 1995.
3. Jain A.K., "Fluid Mechanics (including Hydraulic Machines)", Khanna Publishers, 8th edition, 1995.
4. Ranga Raju, K.G., "Flow through Open Channels", Tata McGraw-Hill, 1985



**UNIT 1 CONCRETE MAKING MATERIALS 9**

Aggregates classification-IS Specifications-Properties-Grading-Methods of combining aggregates-Specified gradings-Testing of aggregates-Cement-Grade of cement-Chemical composition-Testing of concrete-Hydration of cement-Structure of hydrated cement-Special cements-Water chemical admixtures-Mineral admixture.

**UNIT II CONCRETE 9**

Properties of fresh concrete-Hardened concrete-Strength-Elastic properties-Creep and shrinkage-Variability of concrete strength.

**UNIT III MIX DESIGN 9**

Principles of concrete mix design-Methods of concrete mix design-Testing of concrete.

**UNIT IV SPECIAL CONCRETE 9**

Light weight concrete-Fly ash concrete-Fibre reinforced concrete-Polymer concrete-Super plasticized concrete-Epoxy resins and screeds for rehabilitation-Properties and applications-High performance concrete.

**UNIT V CONCRETING METHODS 9**

Process of manufacturing of concrete-Methods of transportation, placing and curing-Extreme weather concreting-Special concreting methods-Vacuum dewatering-Underwater concrete-Special form work

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

- 1.Neville,A.M.,”Properties of Concrete”,Pitman Publishing Limited,1987.
- 2.Shetty,M.S.,”Concrete Technology”,S.Chand and Company Ltd.,2002.

**REFERENCES**

- 1.Rudhani,G.,”Light Weight Concrete”,Academic Kiado,Publishing Home of Hungarian Academy of Sciences,1963.
- 2.Gambhir,M.L.,”Concrete Technology”Tata Mc.Graw Hill Publishers,2008.

**UNIT I SOIL INTER RELATIONS****8**

Nature of Soil – Problems with soil – Phase relation – Sieve analysis – Sedimentation analysis – Atterberg limits – Classification for engineering purposes – BIS Classification system – Soil compaction – Factors affecting compaction – Field compaction methods and monitoring.

**UNIT II SOIL WATER AND WATER FLOW****8**

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction – Effective stress concepts in soil – Total, neutral and effective stress distribution in soil – Permeability – Darcy's law – Permeability measurement in the laboratory – Quick sand condition – Seepage – Laplace equation – Introduction to flow nets – Properties and uses – Application to simple problems.

**UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT****10**

Stress distribution in soil media – Boussinesque formula – Stress due to line load and Circular and rectangular loaded area – Approximate methods – Use of influence charts – Westergaard equation for point load – Components of settlement – Immediate and consolidation settlement – Terzaghi's one dimensional consolidation theory – Governing differential equation – Laboratory consolidation test – Field consolidation curve – NC and OC clays – Problems on final and time rate of consolidation.

**UNIT IV SHEAR STRENGTH****9**

Shear strength of cohesive and cohesionless soils – Mohr – Coulomb failure theory – Saturated soil and unsaturated soil (basics only) – Strength parameters – Measurement of shear strength, direct shear, triaxial compression, unconfined compressive strength and vane shear tests – Types of shear tests based on drainage and their applicability – Drained and undrained behaviour of clay and sand – Stress path for conventional triaxial test.

**UNIT V SLOPE STABILITY****10**

Slope failure mechanisms – Modes – Infinite slopes – Finite slopes – Total and effective stress analysis – Stability analysis for purely cohesive and  $c-\phi$  soils – Method of slices – Modified Bishop's method – Friction circle method – Stability number – Problems – Slope protection measures.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Gopal Ranjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, 2000.
2. Khan, I.H., "A Text Book of Geotechnical Engineering", Prentice Hall of India, 1999.

**REFERENCES**

1. Coduto, D.P., "Geotechnical Engineering Principles and Practices", Prentice Hall of India, 2002.
2. McCarthy, D.F., "Essentials of Soil Mechanics and Foundations Basic Geotechniques", 6th Edition, Prentice Hall of India, 2002.
3. Das, B.M., "Principles of Geotechnical Engineering", 5th Edition, Thomas Books/ Cole, 2002.

## SEMESTER III

19148S31CP

PROBABILITY AND STATISTICS

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### AIM & OBJECTIVE:

At the end of this course students can learn about the axioms of random variable, two dimensional random variables, standard distributions and testing of hypothesis.

### UNIT I PROBABILITY AND RANDOM VARIABLE 9

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

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and Regression - Transformation of random variables - Central limit theorem.

### UNIT III STANDARD DISTRIBUTIONS 9

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

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

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

*Note : Use of approved statistical table permitted in the examination.*

L: 45 T: 15

Total: 60 Periods

### 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

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.

**UNIT I METHODS OF DESIGN OF CONCRETE STRUCTURES 12**

Concept of elastic method, ultimate load method and limit state method – Advantages of limit state method over other methods – Design codes and specification – Limit state philosophy as detailed in IS code – Design of flexural members and slabs by working stress method

**UNIT II LIMIT STATE DESIGN FOR FLEXURE 12**

Analysis and design of one way and two way rectangular slabs subjected to uniformly distributed load for various boundary conditions and corner effects – Analysis and design of singly and doubly reinforced rectangular and flanged beams.

**UNIT III LIMIT STATE DESIGN FOR BOND, ANCHORAGE SHEAR AND TORSION 12**

Behaviour of RC members in bond and anchorage – Design requirements as per current code – Behaviour of RC beams in shear and torsion – Design of RC members for combined bending shear and torsion.

**UNIT IV LIMIT STATE DESIGN OF COLUMNS 12**

Types of columns – Braced and unbraced columns – Design of short column for axial, uniaxial and biaxial bending – Design of long columns.

**UNIT V LIMIT STATE DESIGN OF FOOTING AND DETAILING 12**

Design of wall footing – Design of axially and eccentrically loaded rectangular footing – Design of combined rectangular footing for two columns only

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Varghese, P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, Pvt. Ltd., 2007.
2. Krishna Raju, N., “Design of Reinforced Concrete Structures”, CBS Publishers and Distributors, 2003.

**REFERENCES**

1. Jain, A.K., “Limit State Design of RC Structures”, Nemchand Publications, 2002.
2. Sinha, S.N., “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., 2002.
3. Unnikrishna Pillai, S. and Devadas Menon, “Reinforced Concrete Design”, Tata McGraw-Hill Publishing Company Ltd., 200

**UNIT I DEFLECTION OF DETERMINATE STRUCTURES 9**

Principles of virtual work for deflections – Deflections of pin-jointed plane frames and rigid plane frames – Willot diagram – Mohr's correction.

**UNIT II MOVING LOADS AND INFLUENCE LINES 9  
(DETERMINATE AND INDETERMINATE STRUCTURES)**

Influence lines for reactions in statically determinate structures – Influence lines for members forces in pin-jointed frames – Influence lines for shear force and bending moment in beam sections – Calculation of critical stress resultants due to concentrated and distributed moving loads – Muller Breslau's principle – Influence lines for continuous beams and single storey rigid frames – Indirect model analysis for influence lines of indeterminate structures – Beggs deformer.

**UNIT III ARCHES 9**

Arches as structural forms – Examples of arch structures – Types of arches – Analysis of three hinged, two hinged and fixed arches, parabolic and circular arches – Settlement and temperature effects.

**UNIT IV SLOPE DEFLECTION METHOD 9**

Continuous beams – Settlement rigid frames (without sway) – Principles of symmetry and anti symmetry.

**UNIT V MOMENT DISTRIBUTION METHOD 9**

Analysis of continuous beams – Settlement – Plane rigid frames with and without sway – Naylor's simplification.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Vaidyanadhan, R. and Perumal, P., "Comprehensive Structural Analysis – Vol. 1 and Vol. 2", Laxmi Publications, 2003.
2. Harrison H.B., "Structural Analysis and Design", Part I and II Pergamon Press, 1990.

**REFERENCES**

1. Wang, C.K., "Analysis of Indeterminate Structures", Tata McGraw-Hill, 1983.
2. Negi, L.S. and Jangid, R.S., "Structural Analysis", 6th Edition, Tata McGraw-Hill Publications, 2003.

**UNIT I STONES – BRICKS – CONCRETE BLOCKS 18**

Stone as building material – Criteria for selection – Tests on stones – Deterioration and Preservation of stone work – Bricks – Classification – Manufacture of clay bricks – Tests on bricks – Compressive Strength – Water Absorption – Efflorescence – Bricks for special use – Refractory bricks – Cement and Concrete hollow blocks – Light weight concrete blocks – Code Practices.

**UNIT II LIME – CEMENT – AGGREGATES – MORTAR 18**

Lime – Preparation of lime mortar – Cement. Ingredients – Manufacturing process – Types and Grades – Properties of cement and Cement mortar – Hydration - Compressive strength – Tensile strength – Soundness and consistency – Setting time – Aggregates – Natural stone aggregates – Industrial byproducts – Crushing strength – Impact strength – Flakiness – Abrasion Resistance – Grading – Sand – Bulking – Code Practices.

**UNIT III SUB STRUCTURE CONSTRUCTION 13**

Techniques of Box jacking – Pipe Jacking – under water construction of diaphragm walls and basement – Tunneling techniques – Piling techniques – Driving well and caisson – Sinking cofferdam – Cable anchoring and grouting – Driving diaphragm walls – Sheet piles – Shoring for deep cutting – Large reservoir construction with membranes and Earth system – Well points – Dewatering and stand by plant equipment for underground open excavation.

**UNIT IV SUPER STRUCTURE CONSTRUCTION 12**

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 EQUIPMENTS 10**

Selection of equipment for earth work – Earth moving operations – Types of earthwork equipment – Tractors – Motor graders – Scrapers – Front end loaders – Earth movers – Equipment for foundation and pile driving. Equipment for compaction – Batching and mixing and concreting – Equipment for material handling and erection of structures – Equipment for dredging, trenching, tunneling.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.
2. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003.
3. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of Construction", Dhanpat Rai and Sons, 1997.
4. Sharma, S.C., "Construction Equipment and Management", Khanna Publishers, 1988.

**REFERENCES**

1. Jha, J. and Sinha, S.K., "Construction and Foundation Engineering", Khanna Publishers, 1993.
2. Deodhar, S.V., "Construction Equipment and Job Planning", Khanna Publishers, 1988.
3. Peurifoy, R.L., Ledbetter, W.B. and Schexnayder, C., "Construction Planning, Equipment and Methods", 5th Edition, McGraw Hill, 1995

**OBJECTIVE**

At the end of this course, the student acquires the capacity to test the soil to assess its Engineering and Index properties.

**LIST OF EXPERIMENTS**

1. Grain size distributions – Sieve analysis
2. Grains size distribution – Hydrometer analysis
3. Specific gravity of soil grains
4. Relative density of sands
5. Atterberg limits test
6. Determination of moisture – Density relationship using standard Proctor test.
7. Permeability determination (constant head and falling head methods)
8. Determination of shear strength parameters.
  - i) Direct shear test on cohesion less soil
  - ii) Unconfined compression test on cohesive soil
  - iii) Triaxial compression test
9. One dimensional consolidation test (determination of coefficient of consolidation Only)
10. Field density test (Core cutter and sand replacement methods)

**TOTAL: 45 PERIODS**

**LIST OF EQUIPMENTS**  
(for a batch of 30 students)

Sl.No	Equipments	Qty
1.	Electrical Oven	1 No
2.	Direct Shear test apparatus	1 No
3.	Liquid limit Apparatus	2 Nos
4.	Sieve Shaker	1 No
5.	Sieves (Fine and Coarse Aggregates)	1 Set in each
6.	Soil Permeability Apparatus	1 No
7.	Standard Proctor compaction mould and hammer	1 No
8.	Soil Hydrometer	1 No
9.	Core Cutter	1 No
10.	CBR Apparatus	1 No
11.	Consolidation Apparatus	1 No
12.	Pycnometer	3 Nos
13.	Hydrometer jar	1 No
14.	Triaxial setup	1 No
15.	Compression Proving Ring	3 Nos
16.	Direct Shear test apparatus	1 No
19.	Liquid Limit Apparatus	2 No

## SEMESTER IV

### 19155C41P DESIGN OF REINFORCED CONCRETE STRUCTURES-II

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#### UNIT I RETAINING WALLS 12

Design of cantilever and counter fort retaining walls.

#### UNIT II WATER TANKS 12

Underground rectangular tanks – Domes – Overhead tanks.

#### UNIT III SELECTED TOPICS 12

Design of staircases (ordinary and doglegged) – Design of flat slabs – Design of reinforced concrete walls .

#### UNIT IV YIELD LINE THEORY 12

Application of virtual work method – Square, rectangular, circular and triangular slabs.

#### UNIT V BRICK MASONRY 12

Introduction, classification of walls – Lateral supports and stability – Effective height of wall and columns – Effective length of walls, design loads, load dispersion, permissible stresses and design of axially and eccentrically loaded brick walls.

L: 45 T: 15

Total: 60 Periods

#### TEXT BOOKS

1. Krishna Raju, N., “Design of RC Structures”, CBS Publishers and Distributors, 1998.
2. Dayaratnam, P., “Brick and Reinforced Brick Structures”, Oxford and IBH Publishing House, 1997.

#### REFERENCES

1. Mallick, D.K. and Gupta A.P., “Reinforced Concrete”, Oxford and IBH Publishing Company, 1999.
2. Syal, I.C. and Goel, A.K., “Reinforced Concrete Structures”, A.H. Wheelers and Co. Pvt. Ltd., 1994.
3. Varghese, P.C., “Limit State Design of Reinforced Concrete Structures”, 2<sup>nd</sup> Edition, Prentice-Hall of India Pvt. Ltd., 2002.



**UNIT I FLEXIBILITY METHOD FOR INDETERMINATE FRAMES 9**

Equilibrium and compatibility – Determinate Vs Indeterminate structures – Indeterminacy – Primary structure – Compatibility conditions – Analysis of indeterminate pin-jointed plane frames, continuous beams, rigid jointed plane frames (with redundancy restricted to two).

**UNIT II MATRIX STIFFNESS METHOD 9**

Element and global stiffness matrices – Analysis of continuous beams – Co-ordinate transformations – Rotation matrix – Transformations of stiffness matrices, load vectors and displacements vectors – Analysis of pin-jointed plane frames and rigid frames.

**UNIT III FINITE ELEMENT METHOD 9**

Introduction – Discretisation of a structure – Displacement functions – Truss element – Beam element – Plane stress and plane strain Triangular elements

**UNIT IV PLASTIC ANALYSIS OF STRUCTURES 9**

Statically indeterminate axial problems – Beams in pure bending – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – Plastic analysis of indeterminate beams and frames – Upper and lower bound theorems.

**UNIT V SPACE AND CABLE STRUCTURES 9**

Analysis of Space trusses using method of tension coefficients – Beams curved in plan Suspension cables – Cables with two and three hinged stiffening girders.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Coates R.C., Coutie M.G. and Kong F.K., “Structural Analysis”, ELBS and Nelson, 1990.
2. Negi, L.S. and Jangid, R.S., “Structural Analysis”, Tata McGraw-Hill Publications, 2003.

**REFERENCES**

1. Ghali, A., Nebille, A.M. and Brown, T.G., “Structural Analysis” A Unified Classical and Matrix approach”, 5th Edition, Spon Press, 2003.
2. Vazirani Vaidyanathan, R. and Perumal, P., “Comprehensive Structural Analysis – Vol. I and II”, Laxmi Publications, 2003.

**UNIT I WATER SUPPLY SYSTEMS – SOURCE & CONVEYANCE 6**

Objectives – Population forecasting – Design period – Water demand characteristics – Sources of water – Source selection – Water quality parameters & significance – Standards – Intake structures – Conveyance – Hydraulics – Laying, jointing & testing of pipes – Pump selection – appurtenances

**UNIT II DESIGN PRINCIPLES OF WATER TREATMENT 10**

Objectives – Selection of unit operations and processes – Principles of flocculation, sedimentation, filtration, disinfection – Design principles of flash mixer, flocculator, clarifiers, filters – Disinfection devices – Softening – Demineralisation – Aeration – Iron removal – Defluoridation – Operation and Maintenance aspects - Residue Management

**DISTRIBUTION**

Requirements – Components – Service reservoir design – Analysis of distribution network – Hardy Cross method – Equivalent Pipe method – computer application – Leak detection

**UNIT III SEWERAGE SYSTEM : COLLECTION & TRANSMISSION 10**

Sources of wastewater – Quantity of sanitary sewage – Storm run off estimation – Wastewater characteristics and significance – Effluent disposal standover – Design of sewers – Computer applications – Laying, jointing and testing of sewers – Sewer appurtenances – Pump selection

**UNIT IV SEWAGE TREATMENT & DESIGN PRINCIPLES 10**

Objectives – Selection of unit operation and process – Design principles of primary and secondary treatment, screen chamber, grit chamber, primary sedimentation tanks, activated sludge process – Aeration tank & oxidation ditch – Trickling filter - Stabilisation ponds – Septic tanks with soak pits – Sludge: treatment and disposal – Biogas recovery – Sewage farming

**UNIT V DISPOSAL OF SEWAGE 9**

Disposal on land – Disposal into water bodies – Oxygen sag curve – Streeter Phelp's model – Wastewater reclamation techniques

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Garg, S.K., "Environmental Engineering I & II", Khanna Publishers, New Delhi
2. Modi, P.N., "Environmental Engineering I & II", Standard Book House, Delhi – 6

**REFERENCES**

1. Manual on Water Supply and Treatment, CPHEEO, Government of India, New Delhi, 1999
2. Manual on Sewerage and Sewage Treatment, CPHEEO, Government of India, New Delhi, 1993
3. Hand book on Water Supply and Drainage, SP35, B.I.S., New Delhi, 1987
4. Metcalf and Eddy, M.C., "Wastewater Engineering – Treatment & Reuse", Tata McGraw-Hill Publications, New Delhi, 2003

**LIST OF EXPERIMENTS**

1. Sampling and preservation methods and significance of characterization of water and wastewater.
2. Determination of
  1. P<sup>H</sup> and turbidity
  2. Hardness
  3. Determination of iron & fluoride
  4. Determination of residual chlorine
  5. Determination of Chlorides
  6. Determination of Ammonia Nitrogen
  7. Determination of Sulphate
  8. Determination of Optimum Coagulant Dosage
  9. Determination of available Chlorine in Bleaching powder
  10. Determination of dissolved oxygen
  11. Determination of suspended, volatile and fixed solids
  12. B.O.D. test
  13. C.O.D. test
  14. Introduction to Bacteriological Analysis (Demonstration only)

**TOTAL : 45****REFERENCES**

1. Standard methods for the examination of water and wastewater, APHA, 20<sup>th</sup> Edition, Washington, 1998.
2. Garg, S.K., "Environmental Engineering Vol. I & II", Khanna Publishers, New Delhi.
3. Modi, P.N., "Environmental Engineering Vol. I & II", Standard Book House, Delhi-6

## LIST OF EQUIPMENTS (for a batch of 30 students)

1. P <sup>H</sup> meter		
1. Turbidity meter	-	1 no.
2. Conductivity meter	-	1 No.
3. Refrigerator	-	1 No.
4. BOD incubator	-	1 No.
5. Muffle furnace	-	1 No.
6. Hot air oven	-	1 No.
7. Magnetic stirrer with hot plates	-	5 Nos.
8. Desicator	-	1 No.
9. Jar test apparatus	-	1 No.
10. Water bath	-	1 No.
11. Furniture	-	1 lot
12. Glass waves / Crucibles	-	1 lot
13. Chemicals	-	1 lot
14. COD apparatus	-	1 No.
15. Kjeldane apparatus	-	1 No.
16. Heating mantles	-	5 Nos.
17. Calorimeter	-	1 No.
18. Chlorine comparator	-	1 No.
19. Furniture : Work table	-	10 Nos.
20. Beaker	-	30 Nos.
21. Standard flask	-	30 Nos.
22. Burette with stand	-	15 Nos.
23. Pipette	-	15 Nos.
24. Crucible	-	15 Nos.
25. Filtration assembly	-	1 No.
26. Chemicals	-	Lot

## SEMESTER V

19155C51P

DESIGN OF STEEL STRUCTURES

L T P C

3 1 0 4

### UNIT I INTRODUCTION 12

Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts

### UNIT II TENSION MEMBERS 8

Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag

### UNIT III COMPRESSION MEMBERS 16

Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base

### UNIT IV BEAMS 12

Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices – Design of beam columns

### UNIT V ROOF TRUSSES AND INDUSTRIAL STRUCTURES 12

Roof trusses – Roof and side coverings – Design loads, design of purlin and elements of truss end bearing – Design of gantry girder

L: 45 T: 15

Total: 60 Periods

#### TEXT BOOKS

1. Dayaratnam, P., “Design of Steel Structures”, Second edition, S. Chand & Company, 2003.
2. Ramachandra, S. and Virendra Gehlot, “Design of Steel Structures – Vol. I & II”, Standard Publication, New Delhi, 2007

#### REFERENCES

1. “Teaching Resources for Structural Steel Design – Vol. I & II”, INSDAG, Kolkatta.
2. Gaylord, E.H., Gaylord, N.C., and Stallmeyer, J.E., “Design of Steel Structures”, 3rd edition, McGraw-Hill Publications, 1992
3. Negi L.S.. Design of Steel Structures, Tata McGraw Hill Publishing Pvt Ltd, New Delhi, 2007.
4. IS 800-2007 Indian Standard - General Construction in Steel – code of practice (3<sup>rd</sup> Revision).

**UNIT I SITE INVESTIGATION AND SELECTION OF FOUNDATION 9**

Scope and objectives – Methods of exploration-auguring and boring – Water boring and rotatory drilling – Depth of boring – Spacing of bore hole - Sampling – Representative and undisturbed sampling – sampling techniques – Split spoon sampler, Thin tube sampler, Stationary piston sampler – Bore log report – Penetration tests (SPT and SCPT) – Data interpretation (Strength parameters and Liquefaction potential) – Selection of foundation based on soil condition.

**UNIT II SHALLOW FOUNDATION 9**

Introduction – 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 – problems - Bearing Capacity from insitu tests (SPT, SCPT and plate load) – Allowable bearing pressure, Settlement – Components of settlement – Determination of settlement of foundations on granular and clay deposits – Allowable settlements – Codal provision – Methods of minimising settlement, differential settlement.

**UNIT III FOOTINGS AND RAFTS 9**

Types of foundation – Contact pressure distribution below footings & raft - Isolated and combined footings – types – proportioning - mat foundation – types – use - proportioning – floating foundation.

**UNIT IV PILES 9**

Types of piles and their function – Factors influencing the selection of pile – Carrying capacity of single pile in granular and cohesive soil - Static formula - dynamic formulae (Engineering news and Hiley's) – 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 – Forces on pile caps – under reamed piles – Capacity under compression and uplift.

**UNIT V RETAINING WALLS 9**

Plastic equilibrium in soils – active and passive states – Rankine's theory – cohesionless and cohesive soil - Coloumb's wedge theory – condition for critical failure plane - Earth pressure on retaining walls of simple configurations – Graphical methods (Rebhann and Culmann) - pressure on the wall due to line load – Stability of retaining walls.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS:**

1. Murthy, V.N.S, "Soil Mechanics and Foundation Engineering", UBS Publishers Distribution Ltd, New Delhi, 1999.
2. Gopal Ranjan and Rao, A.S.R. "Basic and Applied Soil Mechanics", Wiley Eastern Ltd., New Delhi (India), 2003.

**REFERENCES:**

1. Das, B.M. "Principles of Foundation Engineering (Fifth edition), Thomson Books / COLE, 2003
2. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi publications pvt. Ltd., New Delhi, 1995.
3. Venkatramaiah, C."Geotechnical Engineering", New Age International Publishers, New Delhi, 1995

<b>UNIT I</b>	<b>INTRODUCTION</b>	<b>7</b>
Types of industries and industrial pollution – Characteristics of industrial wastes – Population equivalent – Bioassay studies – effects of industrial effluents on streams, sewer, land, sewage treatment plants and human health – Environmental legislations related to prevention and control of industrial effluents and hazardous wastes		
<b>UNIT II</b>	<b>CLEANER PRODUCTION</b>	<b>8</b>
Waste management Approach – Waste Audit – Volume and strength reduction – Material and process modifications – Recycle, reuse and byproduct recovery – Applications.		
<b>UNIT III</b>	<b>POLLUTION FROM MAJOR INDUSTRIES</b>	<b>10</b>
Sources, Characteristics, waste treatment flow sheets for selected industries such as Textiles, Tanneries, Pharmaceuticals, Electroplating industries, Dairy, Sugar, Paper, distilleries, Steel plants, Refineries, fertilizer, thermal power plants – Wastewater reclamation concepts		
<b>UNIT IV</b>	<b>TREATMENT TECHNOLOGIES</b>	<b>12</b>
Equalisation – Neutralisation – Removal of suspended and dissolved organic solids - Chemical oxidation – Adsorption - Removal of dissolved inorganics – Combined treatment of industrial and municipal wastes – Residue management – Dewatering - Disposal		
<b>UNIT V</b>	<b>HAZARDOUS WASTE MANAGEMENT</b>	<b>8</b>
Hazardous wastes - Physico chemical treatment – solidification – incineration – Secured land fills		

L: 45 T: 15

Total: 60 Periods

**TEXT BOOKS**

1. M.N.Rao & A.K.Dutta, “Wastewater Treatment”, Oxford - IBH Publication, 1995.
2. W .W. Eckenfelder Jr., “Industrial Water Pollution Control”, McGraw-Hill Book Company, New Delhi, 2000.

**REFERENCES**

1. T.T.Shen, “Industrial Pollution Prevention”, Springer, 1999.
2. R.L.Stephenson and J.B.Blackburn, Jr., “Industrial Wastewater Systems Hand book”, Lewis Publisher, New Yark, 1998
3. H.M.Freeman, “Industrial Pollution Prevention Hand Book”, McGraw-Hill Inc., New Delhi, 1995.
4. Bishop, P.L., “Pollution Prevention: Fundamental & Practice”, McGraw-Hill, 2000.

**19155L55P COMPUTER AIDED BUILDING DRAWING LABORATORY I****L T P C  
0 0 3 2****AIM & OBJECTIVE:**

At the end of this course the student should be able to draft on computer building drawings (Plan, elevation and sectional views) in accordance with development and control rules satisfying orientation and functional requirements for the following:

1. Buildings with load bearing walls (Flat and pitched roof) –Including details of doors and windows	15
2. RCC framed structures	15
3. Industrial buildings – North light roof structures – Trusses	15
4. Perspective view of one and two storey buildings	15

**TOTAL: 60 PERIODS****TEXT BOOKS**

1. Civil Engg. Drawing & House Planning – Varma B.P., Khanna publishers, Delhi
2. Building drawing & detailing – Balagopal & T.S. Prabhu, Spades Publishers, Calicut.

**REFERENCES**

1. Building drawing – Shah.M.G., Tata McGraw-Hill,1992
2. Building planning & Drawing –Kumaraswamy N., Kameswara Rao A., Charotar Publishing
3. Shah, Kale and Patki, Building Drawing with integrated approach to built environment, Tata McGraw-Hill.

**Examination Guideline**

30% of the end semester examination paper shall deal with planning, while the rest 70% shall be based on the drafting skill.

**LIST OF EQUIPMENTS**

(For a batch of 30 students)

<b>Sl. No.</b>	<b>Description of Equipments</b>	<b>Quantity</b>
1.	Computer system of Pentium IV or equivalent	1 for each
2.	Licensed version of any reputed Analysis, Design & Drafting software Student	1 copy for a set of



## SEMESTER VI

19155C61P

ESTIMATION AND COST EVALUATION

L T P C  
3 1 0 4

### UNIT I ESTIMATE OF BUILDINGS 11

Load bearing and framed structures – Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.

### UNIT II ESTIMATE OF OTHER STRUCTURES 10

Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well – estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

### UNIT III SPECIFICATION AND TENDERS 8

Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications – Tenders – Contracts – Types of contracts – Arbitration and legal requirements.

### UNIT IV VALUATION 8

Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Value of building – Calculation of Standard rent – Mortgage – Lease.

### UNIT V REPORT PREPARATION 8

Principles for report preparation – report on estimate of residential building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

**L: 45 T: 15**

**Total: 60 Periods**

### TEXT BOOKS

1. Dutta, B.N., “Estimating and Costing in Civil Engineering”, UBS Publishers & Distributors Pvt. Ltd., 2003
2. Kohli, D.D and Kohli, R.C., “A Text Book of Estimating and Costing (Civil)”, S.Chand & Company Ltd., 2004

### REFERENCE

1. PWD Data Book.

**UNIT I FUNDAMENTALS OF GROUND WATER 9**

Introduction – Characteristic of Ground water – Distribution of water - ground water column – Permeability - Darcy's Law - Laboratory permeability test - Types of aquifers - Hydrogeological Cycle–waterlevelfluctuations.

**UNIT II HYDRAULICS OF FLOW 9**

Storage coefficient - Specific field - Heterogeneity and Anisotropy -Transmissivity - Governing equations of ground water flow - Steady state flow - Dupuit Forch heimer assumptions - Velocity potential-Flownets

**UNIT III ESTIMATION OF PARAMETERS 9**

Transmissivity and Storativity – Pumping test - Unsteady state flow - Thiess method - Jacob method - Image well theory – Effect of partial penetrations of wells - Collectors wells.

**UNIT IV GROUND WATER DEVELOPMENT 9**

Infiltration gallery - Conjunctive use - Artificial recharge -Safe yield -Yield test – Geophysical methods–Selectionofpumps.

**UNIT V WATER QUALITY 9**

Ground water chemistry - Origin, movement and quality - Water quality standards - Saltwater intrusion –Environmental concern.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Raghunath H.M., “Ground Water Hydrology”, Wiley Eastern Ltd., 2000.
2. Todd D.K., “Ground Water Hydrology”, John Wiley and Sons, 2000.

**REFERENCES**

1. C Walton, “Ground Water Resource Evaluation”, McGraw-Hill Publications

**UNIT I THE OWNERS' PERSPECTIVE 9**

Introduction - Project Life Cycle - Types of Construction - Selection of Professional Services - Construction Contractors - Financing of Constructed Facilities - Legal and Regulatory Requirements - Changing Environment of the Construction Industry - Role of Project Managers

**UNIT II ORGANIZING FOR PROJECT MANAGEMENT 9**

Project Management – modern trends - Strategic Planning - Effects of Project Risks on Organization - Organization of Project Participants - Traditional Designer-Constructor Sequence – Professional Construction Management - Owner-Builder Operation - Turnkey Operation - Leadership and Motivation for the Project Team

**UNIT III DESIGN AND CONSTRUCTION PROCESS 9**

Design and Construction as an Integrated System - Innovation and Technological Feasibility - Innovation and Economic Feasibility - Design Methodology - Functional Design - Construction Site Environment

**UNIT IV LABOUR, MATERIAL AND EQUIPMENT UTILIZATION 9**

Historical Perspective - Labour Productivity - Factors Affecting Job-Site Productivity – Labour Relations in Construction - Problems in Collective Bargaining - Materials Management – Material Procurement and Delivery - Inventory Control - Tradeoffs of Costs in Materials Management. - Construction Equipment - Choice of Equipment and Standard Production Rates – Construction Processes Queues and Resource Bottlenecks

**UNIT V COST ESTIMATION 9**

Costs Associated with Constructed Facilities - Approaches to Cost Estimation - Type of Construction Cost Estimates - Effects of Scale on Construction Cost - Unit Cost Method of Estimation - Methods for Allocation of Joint Costs - Historical Cost Data - Cost Indices - Applications of Cost Indices to Estimating - Estimate Based on Engineer's List of Quantities - Estimation of Operating Costs

**L: 45 T: 15****Total: 60 Periods****REFERENCES**

1. Chris Hendrickson and Tung Au, "Project Management for Construction – Fundamental Concepts for Owners, Engineers, Architects and Builders", Prentice Hall, Pittsburgh, 2000.
2. Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", Tata McGraw-Hill Publishing Company, New Delhi, 1998.
3. Frederick E. Gould, "Construction Project Management", Wentworth Institute of Technology, Vary E. Joyce, Massachusetts Institute of Technology, 2000.
4. Choudhury.S, "Project Management", Tata McGraw-Hill Publishing Company, New Delhi, 1988.
5. George J.Ritz, "Total Construction Project Management" - McGraw-Hill Inc, 1994.

**OBJECTIVE:**

To learn the principles and procedures of testing Concrete and Highway materials

**LIST OF EXPERIMENTS**

**I. TESTS ON CEMENT 6**

1. Test for fineness
2. Test for setting times including normal consistency test
3. Mortar cube preparation and testing

**II. TESTS ON AGGREGATES 9**

1. Soundness And Water Absorption
2. Sieve analysis test - Grade Curves
3. Crushing Value - Test
4. Test on Aggregates - Los Angeles Abrasive Testing Machine

**III. TESTS ON HARDENED & FRESH CONCRETE 15**

1. Slump cone test
2. Compaction factor
3. Vee bee test.
4. Cube compression test
5. Tension test of concrete - cylinder split test
6. Flexural test on concrete specimen

**III. TESTS ON BITUMEN 15**

1. Penetration
2. Softening Point
3. Viscosity

**Total: 45**

**LIST OF EQUIPMENTS**

(for a batch of 30 students)

SL.NO	DESCRIPTION OF EQUIPMENTS	QUANTITY
1.	Concrete Mixer	-1No
2.	Slump cone	-3 Nos
3.	Vibrator	-1 No
4.	Trovels and planers	-1 set
5.	UTM – 400 KN capacity	-1 No
6.	Aggregate impact testing machine	-1 No
7.	90 micron sieve	– 2 Nos.
8.	Vicat's Apparatus	– 2 Nos.
9.	70.6 mm x 70.6 mm cube moulds	– 6 Nos.
10.	IS:406-1962 specification sieve	– 2 Nos.
11.	Cylindrical plunger	– 2 Nos.
12.	150 mm x 150 mm cube moulds	– 6 Nos.
13.	Cylindrical mould-150 mm dia and 300 mm height	– 6 Nos.
14.	Steel prism mould (100 mm x 100 mmx500 mm)	– 6 Nos.
10.	Vee-bee consistometer	– 2 Nos.
11.	Compaction factor Apparatus	– 2 Nos.

## SEMESTER VII

19160S71P

TOTAL QUALITY MANAGEMENT

L T P C  
3 1 0 4

### AIM & 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 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.

L: 45 T: 15

Total: 60 Periods

### 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

**UNIT I INTRODUCTION TO HOUSING 9**

Definition of Basic Terms – House, Home, Household, Apartments, Multi storeyed Buildings, Special Buildings, Objectives and Strategies of National Housing Policies, Principle of Sustainable Housing, Housing Laws at State level, Bye-laws at Urban and Rural Local Bodies – levels - Development Control Regulations, Institutions for Housing at National, State and Local levels

**UNIT II HOUSING PROGRAMMES 9**

Basic Concepts, Contents and Standards for Housing Programmes - Sites and Services, Neighbourhoods, Open Development Plots, Apartments, Rental Housing, Co-operative Housing, Slum Housing Programmes, Role of Public, Private and Non-Government Organisations.

**UNIT III PLANNING AND DESIGN OF HOUSING PROJECTS 9**

Formulation of Housing Projects – Site Analysis, Layout Design, Design of Housing Units (DesignProblems)

**UNIT IV CONSTRUCTION TECHNIQUES AND COST-EFFECTIVE MATERIALS 9**

New Constructions Techniques – Cost Effective Modern Construction Materials, Building Centers – Concept, Functions and Performance Evaluation

**UNIT V HOUSING FINANCE AND PROJECT APPRAISAL 9**

Appraisal of Housing Projects – Housing Finance, Cost Recovery – Cash Flow Analysis, Subsidy and Cross Subsidy, Pricing of Housing Units, Rents, Recovery Pattern (Problems).

L: 45 T: 15

Total: 60 Periods

**TEXT BOOKS**

1. Meera Mehta and Dinesh Mehta, Metropolitan Housing Markets, Sage Publications Pvt. Ltd., New Delhi, 1999.
2. Francis Cherunilam and Odeyar D Heggade, Housing in India, Himalaya Publishing House, Bombay, 1997.

**REFERENCES**

1. Development Control Rules for Chennai Metropolitan Area, CMA, Chennai, 2002.
2. UNCHS, National Experiences with Shelter Delivery for the Poorest Groups, UNCHS (Habitat), Nairobi, 1994.
3. National Housing Policy, 1994, Government of India.

**UNIT I MAINTENANCE AND REPAIR STRATEGIES 9**

Maintenance, repair and rehabilitation, Facets of Maintenance, importance of Maintenance various aspects of Inspection, Assessment procedure for evaluating a damaged structure, causes of deterioration

**UNIT II SERVICEABILITY AND DURABILITY OF CONCRETE 11**

Quality assurance for concrete construction concrete properties- strength, permeability, thermal properties and cracking. - Effects due to climate, temperature, chemicals, corrosion – design and construction errors - Effects of cover thickness and cracking

**UNIT III MATERIALS FOR REPAIR 9**

Special concretes and mortar, concrete chemicals, special elements for accelerated strength gain, Expansive cement, polymer concrete, sulphur infiltrated concrete, ferro cement, Fibre reinforced concrete.

**UNIT IV TECHNIQUES FOR REPAIR AND DEMOLITION 8**

Rust eliminators and polymers coating for rebars during repair, foamed concrete, mortar and drypack, vacuum concrete, Guniting and Shotcrete, Epoxy injection, Mortar repair for cracks, shoring and underpinning. Methods of corrosion protection, corrosion inhibitors, corrosion resistant steels, coatings and cathodic protection. Engineered demolition techniques for dilapidated structures-case studies

**UNIT V REPAIRS, REHABILITATION AND RETROFITTING OF STRUCTURES 8**

Repairs to overcome low member strength, Deflection, Cracking, Chemical disruption, weathering corrosion, wear, fire, leakage and marine exposure.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Denison Campbell, Allen and Harold Roper, Concrete Structures, Materials, Maintenance and Repair, Longman Scientific and Technical UK, 1991.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, UK, 1987

**REFERENCES**

1. M.S.Shetty, Concrete Technology - Theory and Practice, S.Chand and Company, New Delhi, 1992.
2. Santhakumar, A.R., Training Course notes on Damage Assessment and repair in Low Cost Housing , "RHDC-NBO" Anna University, July 1992.
3. Raikar, R.N., Learning from failures - Deficiencies in Design, Construction and Service - R&D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
4. N.Palaniappan, Estate Management, Anna Institute of Management, Chennai, 1992.
5. Lakshmi pathy, M. etal. Lecture notes of Workshop on "Repairs and Rehabilitation of Structures", 29 - 30th October 1999.s

## LIST OF ELECTIVES

### SEMESTER IV

#### HARD CORE ELECTIVE I

19155E44AP

HYDROLOGY

L T P C  
3 1 0 4

#### **UNIT I PRECIPITATION 9**

Hydrologic cycle – Types of precipitation – Forms of precipitation – Measurement of Rainfall – Spatial measurement methods – Temporal measurement methods – Frequency analysis of point rainfall – Intensity, duration, frequency relationship – Probable maximum precipitation.

#### **UNIT II ABSTRACTION FROM PRECIPITATION 9**

Losses from precipitation – Evaporation process – Reservoir evaporation – Infiltration process – Infiltration capacity – Measurement of infiltration – Infiltration indices – Effective rainfall.

#### **UNIT III HYDROGRAPHS 9**

Factors affecting Hydrograph – Baseflow separation – Unit hydrograph – Derivation of unit hydrograph – S curve hydrograph – Unit hydrograph of different deviations - Synthetic Unit Hydrograph

#### **UNIT IV FLOODS AND FLOOD ROUTING 9**

Flood frequency studies – Recurrence interval – Gumbel's method – Flood routing – Reservoir flood routing – Muskingum's Channel Routing – Flood control

#### **UNIT V GROUND WATER HYDROLOGY 9**

Types of aquifers – Darcy's law – Dupuit's assumptions – Confined Aquifer – Unconfined Aquifer – Recuperation test – Transmissibility – Specific capacity – Pumping test – Steady flow analysis only.

L: 45 T: 15

Total: 60 Periods

#### **TEXT BOOKS**

1. Subramanya, K., "Engineering Hydrology", Tata McGraw-Hill Publishing Co., Ltd., 2000
2. Raghunath, H.M., "Hydrology", Wiley Eastern Ltd., 2000

#### **REFERENCES**

1. Chow, V.T. and Maidment, "Hydrology for Engineers", McGraw-Hill Inc., Ltd., 2000
2. Singh, V.P., "Hydrology", McGraw-Hill Inc., Ltd., 2000.



**AIM & OBJECTIVE:**

The student is exposed to the different phases in Water Resources viz planning, collection of relevant data on water resources and also on National Water Policy. Reservoir planning, management and economic analysis aspects are covered in detail.

<b>UNIT I</b>	<b>GENERAL</b>	<b>9</b>
Water resources survey – Water resources of India and Tamilnadu – Description of water resources planning – Economics of water resources planning, physical and socio economic data – National Water Policy – Collection of meteorological and hydrological data for water resources development.		
<b>UNIT II</b>	<b>INETWORK DESIGN</b>	<b>9</b>
Hydrologic measurements – Analysis of hydrologic data – Hydrologic station network – Station network design – Statistical techniques in network design.		
<b>UNIT III</b>	<b>WATER RESOURCE NEEDS</b>	<b>9</b>
Consumptive and non-consumptive water use - Estimation of water requirements for irrigation, for drinking and navigation - Water characteristics and quality – Scope and aims of master plan - Concept of basin as a unit for development - Water budget and development plan.		
<b>UNIT IV</b>	<b>RESERVOIR PLANNING AND MANAGEMENT</b>	<b>9</b>
Reservoir - Single and multipurpose – Multi objective - Fixation of Storage capacity -Strategies for reservoir operation - Sedimentation of reservoirs - Design flood-levees and flood walls – Channel improvement.		
<b>UNIT V</b>	<b>ECONOMIC ANALYSIS</b>	<b>9</b>
Estimation of cost and Evaluation of Benefits - Discount rate - Discounting factors - Discounting techniques – Computer Applications.		

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Linsley R.K. and Franzini J.B, “Water Resources Engineering”, McGraw-Hill Inc, 2000.
2. Douglas J.L. and Lee R.R., “Economics of Water Resources Planning”, Tata McGraw-Hill Inc. 2000.
3. Duggal, K.N. and Soni, J.P., “Elements of Water Resources Engineering”, New Age International Publishers

**REFERENCES**

1. Chaturvedi M.C., “Water Resources Systems Planning and Management”, Tata McGraw-Hill Inc., New Delhi, 1997.
2. Goodman Alvin S., “Principles of Water Resources Planning”, Prentice-Hall, 1984.
3. Maass et al. Design of Water Resources Systems, Macmillan, 1968.

**AIM & OBJECTIVE:**

At the end of this course the students can expand his knowledge on site selection of sub structure and super structure, types , components of flooring and roofing and details about stair case.

**UNIT I PRELIMINARY INVESTIGATION 9**  
Principles of planning – Planning regulations and bye-laws-site works and setting out – Excavations and timbering – Sub soil drainage – Electricity lighting on building sites – Winter building – Preparation of layout – Site plan – Orientation of buildings.

**UNIT II SITE SELECTION AND SUB STRUCTURES 9**  
Site selection – Types of building as per NBC – Types of foundations – Shallow – Deep foundations – Machine foundation

**UNIT III SUPER STRUCTURE 9**  
Stone and brick masonry – Composite masonry – Load bearing walls – Cavity walls – Partition walls – Reinforced brick masonry.

**UNIT IV FLOORING AND ROOFING 9**  
Ground floors – Components – Types – Suspended flooring – Upper floors – Types – Methods of laying – Type of roofs – Types of pitched roof – Shell roofs – Folded plate roofs – Constructional practices – Roof covering details.

**UNIT V STAIRCASE AND SERVICES 9**  
Requirement of a good staircase – Type of staircase calculation for geometry – Ramps – Escalators lifts – Types – Handling capacity.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Arora, S.P. and Bindra, S.P., “Building construction Planning Techniques and Methods of Construction”, Dhanpat Rai and Sons, 1997.
2. Punmia, B.C., Ashok Kumar Jain and Arun Kumar Jain, “Building Construction”, Laxmi Publications Pvt., Ltd., 1997.

**REFERENCES**

1. Chudley, “Construction Technology” Vol.1, 2, 3 and 4 ELBS Publisher, 1997.
2. National Building Code of India, Parts III, IV, VII and IX 1983.

**AIM & OBJECTIVE:**

This course covers the principles of contract laws and regulations. Students can acquire knowledge on bidding and accepting, Tamil Nadu transparency in tenders act, appointment, conditions, powers and duties of arbitrator and legal requirements such as tax laws and labour regulations.

**UNIT I CONSTRUCTION CONTRACTS 10**

Indian Contracts Act – Elements of Contracts – Types of Contracts – Features – Suitability – Design of Contract Documents – International Contract Document – Standard Contract Document – Law of Torts

**UNIT II TENDERS 10**

Prequalification – Bidding – Accepting – Evaluation of Tender from Technical, Contractual and Commercial Points of View – Contract Formation and Interpretation – Potential Contractual Problems – World Bank Procedures and Guidelines – Tamilnadu Transparency in Tenders Act.

**UNIT III ARBITRATION 5**

Comparison of Actions and Laws – Agreements – Subject Matter – Violations – Appointment of Arbitrators – Conditions of Arbitration – Powers and Duties of Arbitrator – Rules of Evidence – Enforcement of Award – Costs

**UNIT IV LEGAL REQUIREMENTS 10**

Insurance and Bonding – Laws Governing Sale, Purchase and Use of Urban and Rural Land – Land Revenue Codes – Tax Laws – Income Tax, Sales Tax, Excise and Custom Duties and their Influence on Construction Costs – Legal Requirements for Planning – Property Law – Agency Law – Local Government Laws for Approval – Statutory Regulations

**UNIT V LABOUR REGULATIONS 10**

Social Security – Welfare Legislation – Laws relating to Wages, Bonus and Industrial Disputes, Labour Administration – Insurance and Safety Regulations – Workmen’s Compensation Act – Indian Factory Act – Tamilnadu Factory Act – Child Labour Act - Other Labour Laws

**L: 45 T: 15****Total: 60 Periods****REFERENCES:**

1. Gajaria G.T., “Laws Relating To Building and Engineering Contracts in India”, M.M.Tripathi Private Ltd., Bombay, 1982
2. Jimmie Hinze, “Construction Contracts”, McGraw Hill, 2001.
3. Joseph T. Bockrath, “Contracts and the Legal Environment for Engineers and Architects”, McGraw Hill, 2000.
4. Kwaku, A., Tenah, P.E. Jose M.Guevara, P.E., “Fundamentals of Construction Management and Organisation”, Prentice Hall, 1985.
5. Patil. B.S, “Civil Engineering Contracts and Estimates”, Universities Press (India) Private Limited, 2006.

## SEMESTER V

### HARD CORE ELECTIVE II

19155E54AP

COMPUTER AIDED ANALYSIS AND DESIGN

L T P C

3 1 0 4

#### AIM & OBJECTIVE:

This course covers the principles, applications of computer in Civil Engineering systems.

#### UNIT I INTRODUCTION

Elements of Computer Aided Design and its advantages over conventional design. Hardware required for CAD works.

#### UNIT II BASIC PRINCIPLES

Principles of software design, concept of modular programming, debugging and testing.

#### UNIT III APPLICATIONS

Computer applications in analysis and design of Civil Engineering systems.

#### UNIT IV SOFTWARE PACKAGES

Use of software packages in the area of Structural, Geotechnical, and Environmental fields.

#### UNIT V NEURAL NETWORKS

Expert system, their development and applications, Introduction to Neural Networks.

**Total: 45 Periods**

#### REFERENCE:

1. Computer Aided Design – S. Rajiv, Narosa Publication
2. A.I. and Expert System – Robert L. Lertner & / Lane E. Drang, McGraw Hill
3. “Neural Computing: Wasserman, Vonnostrand.

**OBJECTIVE**

This course imparts the students knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering. The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders. The students acquire knowledge on site investigation for location and planning of harbours.

**UNIT I HIGHWAY PLANNING AND ALIGNMENT 9**

History of road construction – Highway development in India – Jayakar committee Recommendations and realisations – Twenty year road development plans – Concepts of on-going highways development programmes at national level – Institutions for highway development at national level – India road congress – Highway research board, national highway authority of India – Ministry of Road Transport and Highway (MORTH) Central road research institute – Requirements of ideal alignment – Factors controlling highway alignment engineering surveys for alignment – Conventional methods and modern methods (Remote sensing, GIS and GPS techniques) – Classification and cross section of urban and rural roads – Highway cross sectional elements – Right of way, carriage way, camber, kerbs, shoulders and footpaths (IRC Standards) – Cross sections of different class of roads – Principles of highway financing.

**UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9**

Design of horizontal alignment – Horizontal curves super elevation – Widening of pavements on horizontal curves and transition curves design of vertical alignments – Rolling, limiting, exceptional and minimum gradients, summit and valley curves – Sight distances – Factors affecting sight distances – PIEV theory, stopping sight distance (SSD) – Overtaking sight distance – Sight distance at intersections – Intermediate sight distance and illumination sight distance [Derivations and problems in SSD and OSD] – Geometric design of hill roads [IRC Standards Only].

**UNIT III FLEXIBLE AND RIGID PAVEMENTS 9**

Rigid and flexible pavements – Components and their functions – Design principles of flexible and rigid pavements – Factors affecting the design of pavements – ESWL, climate, sub-grade soil and traffic – Design practice for flexible pavements (CBR method, IRC Method and Recommendations – Problems) – Design practice for rigid pavements – IRC Recommendations (concept only).

**UNIT IV RAILWAY PLANNING AND DESIGN 12**

Role of Indian Railways in National Development – Railways for Urban Transportation – LRT & MRTS. - Engineering Surveys for Track Alignment – Obligatory points - Conventional and Modern methods (Remote Sensing, GIS & GPS, EDM and other equipments) - Permanent Way, its Components and their Functions: Rails - Types of Rails, Rail Fastenings, Concept of Gauges, Coning of Wheels, Creeps and kinks -Sleepers – Functions, Materials, Density – Functions, Materials, Ballastless Tracks - Geometric Design of Railway Tracks – Gradients and Grade Compensation, Super-Elevation, Widening of Gauges in Curves, Transition Curves, Horizontal and Vertical Curves.

**UNIT V RAILWAY TRACK CONSTRUCTION, MAINTENANCE AND OPERATION 12**  
Points and Crossings - Design of Turnouts, Working Principle - Signalling, Interlocking and Track Circuiting  
- Construction & Maintenance – Conventional, Modern methods and Materials, Track Drainage - Track  
Modernisation– Automated maintenance and upgrading, Re-laying of Track, Lay outs of Railway Stations  
and Yards, Rolling Stock, Tractive Power, Track Resistance, Level Crossings.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Saxena Subhash C and Satyapal Arora, A Course in Railway Engineering, Dhanpat Rai and Sons, Delhi, 1998.
2. Khanna, K. and Justo, C.E.G., “Highway Engineering”, Khanna Publishers, 2001.

**REFERENCES**

1. Rangwala, Railway Engineering, Charotar Publishing House, 1995.
2. Rangwala, Airport Engineering, Charotar Publishing House, 1996.
3. Oza.H.P. and Oza.G.H., “A course in Docks & Harbour Engineering”. Charotar Publishing Co.1976
4. J.S. Mundrey, “A course in Railway Track Engineering”. Tata McGraw Hill, 2000

**OBJECTIVE**

At the end of this course the student shall be able to understand about geological formations, classification and morphology of rocks, and the importance of the study of geology for civil engineers with regard to founding structures like dams, bridges, buildings, etc. The student shall also be able to appreciate the importance of geological formation in causing earthquakes and land slides.

**UNIT I GENERAL GEOLOGY****9**

Geology in Civil Engineering – Branches of geology – Earth Structures and composition – Elementary knowledge on continental drift and plate technologies – Earth processes – Weathering – Work of rivers, wind and sea and their engineering importance – Earthquake belts in India – Groundwater – Mode of occurrence – Prospecting – importance in civil engineering

**UNIT II MINERALOGY****9**

Elementary knowledge on symmetry elements of important crystallographic systems – Physical properties of minerals – Study of the following rock forming minerals – Quartz family – Feldspar family – Augite, hornblende, biotite, muscovite, calcite, garnet – properties – behaviour and engineering significance of clay minerals – Fundamentals of process of formation of ore minerals – Coal and petroleum – Their origin and occurrence in India.

**UNIT III PETROLOGY****9**

Classification of rocks – Distinction between igneous, sedimentary and metamorphic rocks – Description occurrence, engineering properties and distribution of following rocks – Igneous rocks – Granite, syenite, diorite, gabbro, pegmatite, dolerite and basalt sedimentary rocks sandstone – Limestone, shale congl, conglomerate and breccia. Metamorphic rocks – Quartzite, marble, slate, phyllite, gneiss and schist.

**UNIT IV STRUCTURAL GEOLOGY AND GEOPHYSICAL METHOD****9**

Attitude of beds – Outcrops – Introduction to geological maps Study of structures – Folds, faults and joints – Their bearing on engineering construction – Seismic and electrical methods for civil engineering investigations.

**UNIT V GEOLOGICAL INVESTIGATIONS IN CIVIL ENGINEERING****9**

Remote sensing techniques – Study of air photos and satellite images – Interpretation for civil Engineering projects – Geological conditions necessary for construction of dams - Tunnels – Buildings – Road cuttings – Land slides – Causes and preventions – Sea erosion and coastal protection.

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Parbin Singh, "Engineering and General Geology", Katson Publication House, 1987
2. Krynine and Judd, "Engineering Geology and Geotechniques", McGraw-Hill Book Company, 1990

**REFERENCES**

1. Legeet, "Geology and Engineering", McGraw-Hill Book Company 1998
2. Blyth, "Geology for Engineers", ELBS, 1995.

**UNIT I HIGHWAY PLANNING AND ALIGNMENT 9**

Tresaguet and Macadam's method of Road Construction, Highway Development in India - Jayakar Committee Recommendations and Realisations, Twenty-year Road Development Plans, Concepts of On-going Highway Development Programmes at National Level, Institutions for Highway Development at National level - Indian Roads Congress, Highway Research Board, National Highway Authority of India, Ministry of Road Transport and Highways (MORTH) and Central Road Research Institute.

Requirements of Ideal Alignment, Factors Controlling Highway Alignment Engineering Surveys for Alignment - Conventional Methods and Modern Methods (Remote Sensing, GIS and GPS techniques) Classification and Cross Section of Urban and Rural Roads (IRC), Highway Cross Sectional Elements – Right of Way, Carriage Way, Camber, Kerbs, Shoulders and Footpaths [IRC Standards], Cross sections of different Class of Roads.

**UNIT II GEOMETRIC DESIGN OF HIGHWAYS 9**

Design of Horizontal Alignments – Super elevation, Widening of Pavements on Horizontal Curves and Transition Curves [Derivation of Formulae and Problems] Design of Vertical Alignments – Rolling, Limiting, Exceptional and Minimum Gradients, Summit and Valley Curves Sight Distances - Factors affecting Sight Distances, PIEV theory, Stopping Sight Distance (SSD), Overtaking Sight Distance (OSD), Sight Distance at Intersections, Intermediate Sight Distance and Illumination Sight Distance

**UNIT III DESIGN OF RIGID AND FLEXIBLE PAVEMENTS 9**

Rigid and Flexible Pavements- Components and their Functions, Design Principles of Flexible and Rigid Pavements, Factors affecting the Design of Pavements - ESWL, Climate, Sub-grade Soil and Traffic. Design Practice for Flexible Pavements [CBR method, IRC Method and Recommendations- Problems]. Design Practice for Rigid Pavements – Joints

**UNIT IV HIGHWAY MATERIALS AND CONSTRUCTION PRACTICE 9**

Desirable Properties and Testing of Highway Materials: - (Tests have to be demonstrated in Highway Engineering Laboratory) Soil – California Bearing Ratio Test, Field Density Test. Aggregate - Crushing, Abrasion, Impact Tests, Water absorption, Flakiness and Elongation indices and Stone polishing value test. Bitumen - Penetration, Ductility, Viscosity, Binder content and Softening point Tests. Construction Practice - Water Bound Macadam Road, Bituminous Road and Cement Concrete Road [as per IRC and MORTH specifications] Highway Drainage [IRC Recommendations]

**UNIT V HIGHWAY MAINTENANCE 9**

Types of defects in Flexible pavements – Surface defects, Cracks, Deformation, Disintegration – Symptoms, Causes and Treatments. Types of Pavement, Failures in Rigid Pavements – Scaling, Shrinkage, Warping, Structural Cracks Spalling of Joints and Mud Pumping – and Special Repairs. Pavement Evaluation – Pavement Surface Conditions and Structural Evaluation, Evaluation of pavement Failure and strengthening - Overlay design by Benkelman Beam Method [Procedure only], Principles of Highway Financing

**L: 45 T: 15****Total: 60 Periods****TEXT BOOKS**

1. Khanna K and Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001.
2. Kadiyali L R, Principles and Practice of Highway Engineering, Khanna Technical Publications, Delhi, 2000.

**REFERENCES**

1. IRC Standards (IRC 37 - 2001 & IRC 58 -1998)
2. Bureau of Indian Standards (BIS) Publications on Highway Materials
3. Specifications for Road and Bridges, MORTH (India)



## SEMESTER VI

### HARD CORE ELECTIVE III

19155E64AP

REMOTE SENSING AND GIS

L T P C  
3 1 0 4

#### **UNIT I EMR AND ITS INTERACTION WITH ATMOSPHERE AND EARTH MATERIAL**

9

Definition of remote sensing and its components – Electromagnetic spectrum – Wavelength regions important for remote sensing – Wave theory, particle theory, stefan – Boltzman and Wein’s displacement law atmospheric scattering, absorption – Atmospheric windows – Spectral signature concepts – Typical spectral reflective characteristics of water, vegetation, soil.

#### **UNIT II PLATFORMS AND SENSORS**

9

Types of platforms – Orbit types, sun synchronous and geosynchronous – Passive and active sensors – Resolution concepts – Payload description of important earth resources and meteorological satellites – Airborne and space borne TIR and microwave sensors – Types of data products.

#### **UNIT III IMAGE INTERPRETATION AND ANALYSIS**

9

Types of image interpretation – Visual interpretation keys – Basic elements of image interpretation – Digital image processing – Pre-processing – Image enhancement techniques – Multispectral image classification – Supervised and unsupervised.

#### **UNIT IV GEOGRAPHIC INFORMATION SYSTEM**

9

Introduction – Maps – Definitions – Map projections – Types of projections – Map analysis – GIS definition – Basic components of GIS – Standard GIS soft wares – Data type – Spatial and non spatial (attribute data) – Measurement scales – Data Base Management Systems (DBMS).

#### **UNIT V DATA-ENTRY, STORAGE AND ANALYSIS**

9

Data models: vector and raster – Data compression – Data input by digitization and scanning – Attribute data analysis and integrated data analysis – Modeling in GIS – Highway alignment studies – Land information system.

**L: 45 T: 15**

**Total: 60 Periods**

#### **TEXT BOOKS**

- 1 Thomas, L.M. and Ralph, K.W., “Remote Sensing and Image Interpretation ”,John Wiley and Sons, 2002.
2. Anji Reddy, M., “Text Book of Remote Sensing and Geographical information Systems”, 3rd Edition, BS Publications, 2006.

#### **REFERENCES**

1. Lo, C.P. and Yeung, A.K.W., “Concepts and Techniques of GIS”, Prentice Hall of India Pvt. Ltd., 2002.
2. Burrough, P.A. and Rachael A.Mc. Donnell “Principles of GIS”, Oxford University Press, 2006.
3. Lan Heywood, “An Introduction to GIS”, Pearson Education Asia, 2000

**AIM & OBJECTIVE:**

This course imparts the students' knowledge of planning, design, construction and maintenance of railway tracks. The students acquire proficiency in the application of modern techniques such as GIS, GPS and remote sensing in Railway Engineering.

**UNIT I INTRODUCTION 9**  
Role of Indian railways in national development – Permanent way its components and their functions – Types of rails – Rail fastenings – Sleepers – Ballasts – Ballast less tracks.

**UNIT II TRACK ALIGNMENT 9**  
Engineering surveys for track alignment – Obligatory points – Conventional methods – Modern methods – EDM – Remote sensing – GIS – GPS – Track in cutting – Track on embankments.

**UNIT III GEOMETRIC DESIGN OF TRACKS 9**  
Gradients – Grade compensation – Super-elevation – Widening of gauges in curves – Transition curves – Vertical curves.

**UNIT IV TRACK CONSTRUCTION 9**  
Points and crossings – Turnouts – Signalling – Interlocking and track circuiting – Construction – Conventional and modern methods – Materials used.

**UNIT V MAINTENANCE AND OPERATION 9**  
Track drainage – Track modernization – Automated maintenance and upgrading – Lay outs of railway stations and yards – Rolling stock – Tractive power – Track resistance – Level crossings.

**TOTAL: 45 PERIODS**

**TEXT BOOK**

1. Saxena Subhash, C. and Satyapal Arora, A., "Course in Railway Engineering", Dhanpat Rai and Sons, 2003.
2. Agarwal, M.M ,and Chandra.S., "Railway Engineering", Oxford University Press,2008.

**REFERENCES**

1. Rangwala, "Railway Engineering", Charotar Publishing House, 2007.
2. Gupta, B.L. and Amit Gupta, , "Railway Engineering", Standard Publishers Distributors,2005

**AIM & OBJECTIVE:**

The student develops skills on airport planning and design with the prime focus on runway and taxiway geometrics. Students become conversant with the definition, purpose, location and materials of coastal structures such as piers, breakwaters, wharves, jetties, quays and spring fenders. The students acquire knowledge on site investigation for location and planning of harbours.

**UNIT I AIRPORT PLANNING AND DESIGN 8**  
Components of airports – Airport planning – Runway design – Orientation – Wind rose diagram – Taxiway design – Separation distances – Design speed – Drainage.

**UNIT II AIRPORT AND LAYOUTS 10**  
Airport zoning – Clearance over highways and railways – Airport layouts – Apron – Hangars – Terminal buildings – Airports buildings – Passenger flow – Passenger facilities.

**UNIT III AIR TRAFFIC CONTROL 8**  
Visual aids – Runway and taxiway markings – Wind direction indicators – Runway and taxiway lightings – Air traffic control network – Helipads – Service equipments.

**UNIT IV DOCKS AND HARBOURS 10**  
Definition of terms – Harbours – Ports – Docks – Tides – Waves – Littoral drift – Sounding, satellite ports – Classification of harbors – Site selection and investigation – Dry and wet docks – Light houses – Mooring accessories.

**UNIT V COASTAL STRUCTURES 9**  
Piers – Sliways – Breakwaters – Wharves – Jetties – Quays – Spring fenders – Coastal shipping – Inland water transport – Container transportation – Pipe ways – Rope ways.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Khanna, S.K., Arora, M.G. and Jain, S.S., "Airport Planning and Design", Namchand and Brother, 1999.
2. Bindra, S.P., "A course in Docks and Harbour Engineering", Dhanpat Rai and Sons, 1993.

**REFERENCES**

1. Seetha Raman, S., "Docks and Harbour Engineering", Umesh Publications, 1992.
2. Ranga Wala, S., "Airport Engineering", Chasotar Publishing House, 1996.
3. Vazirani and Chandolas, S.P., "Transportation Engineering", Khanna Publications, 1991.

**OBJECTIVE**

At the end of the course the student will possess knowledge about Electronic surveying

**UNIT I FUNDAMENTALS**

7

Methods of measuring distance, historical development, basic principles of EDM, classifications, applications and comparison with conventional surveying.

**UNIT II BASIC ELECTRONICS**

8

Fundamentals of electronics, resonant circuits, semiconductors, Lasers, Cathode ray tube, photo multiplier tube, transducers, oscillators, frequency mixing, modulation and demodulation, Kerrcell modulator, measurement of phase difference, reflectors and power sources.

**UNIT III PROPAGATION OF ELECTROMAGNETIC WAVES**

11

Definition, classification, applications, propagation properties, wave propagation at lower and higher frequencies. Refractive index, factors affecting, computation of group refractive index for light and near infrared waves at standard conditions and ambient conditions, reference refractive index, first velocity correction, computation of refractive index for microwaves, measurement of atmospheric parameters, mean refractive index, real time application of first velocity correction, second velocity correction and total atmospheric correction.

**UNIT IV ELECTROMAGNETIC DISTANCE MEASURING SYSTEM**

11

Electro-optical system, measuring principle, working principle, sources of error, infrared EDM instruments, Laser EDM instruments and total station. Microwave system, measuring principle, working principle, sources of error, microwave EDM instruments, comparison with Electrooptical system, care and maintenance of EDM instruments, Modern Positioning Systems. EDM traversing, trilateration and base line measurement using EDM.

**UNIT V FIELD STUDIES**

8

Study of different EDM instruments and Total Station. EDM traversing, trilateration and base line measurement using EDM.

**L: 45 T: 15**

**Total: 60 Periods**

**REFERENCES**

1. Burnside, C.D. Electromagnetic distance measurement Crosby Lock wood staples, U.K. 1971.
2. Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 1990.
3. Laurila, S.H. Electronic Surveying in Practice, John Wiley and Sons Inc, 1983.
4. Soastamoinen, J.J. Surveyor's guide to electro-magnetic Distance Measurement, Adam Hilger Ltd., 1967.

**SEMESTER VII  
HARD CORE ELECTIVE IV  
AIR POLLUTION MANAGEMENT**

19155E74AP

**L T P C  
3 1 0 4**

**AIM & OBJECTIVE:**

This subject covers the sources, characteristics and effects of air and noise pollution and the methods of controlling the same. The student is expected to know about source inventory and control mechanism.

**UNIT I SOURCES AND EFFECTS OF AIR POLLUTANTS 9**

Classification of air pollutants – Particulates and gaseous pollutants – Sources of air pollution – Source inventory – Effects of air pollution on human beings, materials, vegetation, animals – global warming-ozone layer depletion, Sampling and Analysis – Basic Principles of Sampling – Source and ambient sampling – Analysis of pollutants – Principles.

**UNIT II DISPERSION OF POLLUTANTS 9**

Elements of atmosphere – Meteorological factors – Wind roses – Lapse rate - Atmospheric stability and turbulence – Plume rise – Dispersion of pollutants – Dispersion models – Applications.

**UNIT III AIR POLLUTION CONTROL 15**

Concepts of control – Principles and design of control measures – Particulates control by gravitational, centrifugal, filtration, scrubbing, electrostatic precipitation – Selection criteria for equipment - gaseous pollutant control by adsorption, absorption, condensation, combustion – Pollution control for specific major industries.

**UNIT IV AIR QUALITY MANAGEMENT 7**

Air quality standards – Air quality monitoring – Preventive measures - Air pollution control efforts – Zoning – Town planning regulation of new industries – Legislation and enforcement – Environmental Impact Assessment and Air quality

**UNIT V NOISE POLLUTION 5**

Sources of noise pollution – Effects – Assessment - Standards – Control methods – Prevention

**Total: 45 Periods**

**TEXT BOOKS**

1. Anjaneyulu, D., “Air Pollution and Control Technologies”, Allied Publishers, Mumbai, 2002.
2. Rao, C.S. Environmental Pollution Control Engineering, Wiley Eastern Ltd., New Delhi, 1996.
3. Rao M.N., and Rao H. V. N., Air Pollution Control, Tata-McGraw-Hill, New Delhi, 1996.

**REFERENCES**

1. Mahajan S.P., Pollution Control in Process Industries, Tata McGraw-Hill Publishing Company, New Delhi, 1991.
2. Peavy S.W., Rowe D.R. and Tchobanoglous G. Environmental Engineering, McGraw Hill, New Delhi, 1985.
3. Garg, S.K., “Environmental Engineering Vol. II”, Khanna Publishers, New Delhi

**AIM & OBJECTIVE:**

At the end of this course the student shall be able to appreciate modular construction, industrialised construction and shall be able to design some of the prefabricated elements and also have the knowledge of the construction methods using these elements.

**UNIT I INTRODUCTION 9**

Need for prefabrication – Principles – Materials – Modular coordination – Standardization – Systems – Production – Transportation – Erection.

**UNIT II PREFABRICATED COMPONENTS 9**

Behaviour of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls

**UNIT III DESIGN PRINCIPLES 9**

Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.

**UNIT IV JOINT IN STRUCTURAL MEMBERS 9**

Joints for different structural connections – Dimensions and detailing – Design of expansion joints

**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****TEXT BOOKS**

1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., Knowledge based process planning for construction and manufacturing, Academic Press Inc., 1994

**REFERENCES**

1. Koncz T., Manual of precast concrete construction, Vols. I, II and III, Bauverlag, GMBH, 1971.
2. Structural design manual, Precast concrete connection details, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 1978.

**AIM & OBJECTIVE:**

At the end of this course the student shall be able to choose appropriate bridge structure and design it for given site conditions.

**UNIT I INTRODUCTION 9**  
Design of through type steel highway bridges for IRC loading - Design of stringers, cross girders and main girders - Design of deck type steel highway bridges for IRC loading – Design of main girders

**UNIT II STEEL BRIDGES 9**  
Design of pratt type truss girder highway bridges - Design of top chord, bottom chord, web members - Effect of repeated loading - Design of plate girder railway bridges for railway loading - Wind effects - Design of web and flange plates - Vertical and horizontal stiffeners.

**UNIT III REINFORCED CONCRETE SLAB BRIDGES 9**  
Design of solid slab bridges for IRC loading - Design of kerb - Design of tee beam bridges - Design of panel and cantilever for IRC loading

**UNIT IV REINFORCED CONCRETE GIRDER BRIDGES 9**  
Design of tee beam - Courbon's theory - Pigeaud's curves - Design of balanced cantilever bridges - Deck slab - Main girder - Design of cantilever - Design of articulation.

**UNIT V PRESTRESSED CONCRETE BRIDGES 9**  
Design of prestressed concrete bridges - Preliminary dimensions - Flexural and torsional parameters - Courbon's theory - Distribution coefficient by exact analysis - Design of girder section - Maximum and minimum prestressing forces - Eccentricity - Live load and dead load shear forces - cable zone in girder –Check for stresses at various sections - Check for diagonal tension - Diaphragms - End block - Short term and long term deflections.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Johnson Victor D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co., New Delhi, 1990.
2. Rajagopalan, N. Bridge Superstructure, Alpha Science International, 2006

**REFERENCES**

1. Phatak D.R., “Bridge Engineering”, Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S., “Bridge Engineering”, Tata McGraw-Hill, New Delhi, 1996.

**UNIT I INTRODUCTION – THEORY AND BEHAVIOUR 9**

Basic concepts – Advantages – 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 9**

Flexural strength – Simplified procedures as per codes – Strain compatibility method – Basic concepts in selection of cross section for bending – Stress distribution in end block – Design of anchorage zone reinforcement – Limit state design criteria – Partial prestressing – Applications.

**UNIT III CIRCULAR PRESTRESSING 9**

Design of prestressed concrete tanks – Poles and sleepers.

**UNIT IV COMPOSITE CONSTRUCTION 9**

Analysis for stresses – Estimate for deflections – Flexural and shear strength of composite members.

**UNIT V PRE-STRESSED CONCRETE BRIDGES 9**

General aspects – Pretensioned prestressed bridge decks – Post tensioned prestressed bridge decks – Principles of design only.

**L: 45 T: 15**

**Total: 60 Periods**

**TEXT BOOKS**

1. Krishna Raju, N., “Prestressed Concrete”, Tata McGraw Hill Company, 1998.
2. Mallic, S.K. and Gupta, A.P., “Prestressed Concrete”, Oxford and IBH publishing Co. Pvt. Ltd. 1997.

**REFERENCES**

1. Ramaswamy, G.S., “Modern Prestressed Concrete Design”, Arnold Heinimen, 1990.
2. Lin, T.Y., “Design of Prestressed Concrete Structures”, Asia Publishing House, 1995.
3. Sheppard, D.A., William, R. and Philips, “Plant Cast Precast and Prestressed Concrete – A Design Guide”, McGraw Hill, 1992.





**PRIST**  
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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 2019]**

[for candidates admitted to B.Tech (Civil Engineering) program from June 2019 onwards]

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## Program Educational Objectives

PEO1 To produce graduates who have developed the skills required to design Civil Engineering systems and facilities, including the graduate's abilities to formulate problems, to think creatively, to synthesize information, and to work collaboratively in teams.

PEO2 To produce graduates who are trained thoroughly in methods of analysis, including the mathematical and computational skills appropriate for Civil Engineers to use when problem solving.

PEO3 To produce graduates who are prepared for life-long learning and successful careers as Civil Engineers & also taught to use current, experimental and data analysis techniques for Civil Engineering applications.

PEO4 Contribute towards technological development through academic research and industrial practices.

PEO5 Practice their profession with good communication, leadership, ethics and social responsibility.

## PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **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.
3. **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.
4. **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.
5. **The engineer and society:** An ability to develop the professional status using the broad education to understand the potential impact of Engineering solutions in various geographical settings including societal and environmental contexts.
6. **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.
7. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
8. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

9. **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.
10. **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.
11. **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	Programme Outcomes										
	A	B	C	D	E	F	G	H	I	J	K
PEO 1	3	3	2	3	2	1	1	2	1	1	3
PEO 2	3	3	3	3	3	1	1	1	1	1	1
PEO 3	3	3	3	3	3	2	2	3	1	2	2
PEO 4	3	3	2	3	3	2	3	2	1	2	2
PEO 5	3	3	3	3	3	3	3	2	2	2	2

1-Reasonable: 2- Significant: 3- Strong

# COURSE STRUCTURE

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

**I - VIII SEMESTERS CURRICULUM AND SYLLABI**

**B.TECH (FT) CIVIL**

**[REGULATION 2019]**

**SEMESTER I**

Sl.No	Course Code	Course Title	Periods			Credit
			Per Week			
			L	T	P	
<b>THEORY</b>						
1	19147S11	Communicative English	4	0	0	4
2	19148S12	Engineering Mathematics – I	3	2	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
<b>PRACTICALS</b>						
7	19150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	19149L18	Physics and Chemistry Laboratory	0	0	3	2
9	191VEA19	Value Education				-
<b>TOTAL</b>						25

**SEMESTER II**

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	19147S21	Technical English (All Branches)	4	0	0	4
2.	19148S22A	Engineering Mathematics II (All Branches)	4	0	0	4
3.	19149S23D	Physics for Civil Engineering	3	0	0	3
4.	19149S24A	Environmental Science And Engineering	3	0	0	3
5.	19153S25E	Basic Electrical And Electronics Engineering	3	0	0	3
6.	19154S26D	Engineering Mechanics	3	2	0	4
<b>PRACTICALS</b>						
7.	19154L27	Engineering Practices Laboratory	0	0	3	2
8.	19155L28E	Computer Aided Building Drawing Lab	0	0	3	2
9.	191ICA29	Fundamentals of Indian Constitution and Economy	0	0	0	-
<b>TOTAL</b>			20	2	6	25

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

### SEMESTER III

S. No	Sub. Code	Name of the Subject	L	T	P	C
<b>THEORY</b>						
1	19148S31C	Transforms and Partial Differential Equations	4	0	0	4
2	19155C32	Engineering Geology	3	2	0	4
3	19155C33	Construction Materials	4	0	0	4
4	19155C34	Strength of Materials -I	3	0	0	3
5	19155C35	Fluid Mechanics	3	2	0	4
6	19155C36	Surveying	4	0	0	3
<b>PRACTICALS</b>						
7	19155L37	Surveying Laboratory	0	0	3	2
8	19155L38	Construction Materials Laboratory	0	0	3	2
9	19155L39	Interpersonal Skills / Listening and Speaking	0	0	2	1
TOTAL						27

### SEMESTER IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
<b>THEORY</b>						
1	19148S41C	Numerical Methods	4	0	0	4
2	19155C42	Construction Techniques and Practices	3	2	0	4
3	19155C43	Strength of Materials II	4	0	0	4
4	19155C44	Applied Hydraulic Engineering	3	0	0	3
5	19155C45	Concrete Technology	3	2	0	4
6	19155C46	Soil Mechanics	3	0	0	3
<b>PRACTICALS</b>						
7	19155L47	Strength of Materials Lab	0	0	3	2
8	19155L48	Hydraulic Engineering Lab	0	0	3	2
9	19155L49	Advanced Reading & Writing	0	0	2	1
10	19155CRS	Research Led Seminar	0	0	2	1

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

TOTAL	28
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**SEMESTER – V**

S. No	Sub. Code	Name of the Subject	L	T	P	C
<b>THEORY</b>						
1	19155C51	Design of Reinforced Cement Concrete Elements	4	0	0	4
2	19155C52	Structural Analysis I	3	2	0	4
3	19155C53	Water Supply Engineering	3	0	0	3
4	19155FE54	Open Elective I	3	0	0	3
5	19155E55	Elective I	3	0	0	3
6	19155C56	Foundation Engineering	3	0	0	3
<b>PRACTICALS</b>						
7	19155L57	Soil Mechanics Lab	0	0	3	2
8	19155L58	Water and Waste Water Analysis Lab	0	0	3	2
9	19155L59	Survey Camp	0	0	2	2
10	19155CRM	Research Methodology	0	0	2	3
TOTAL						29

**SEMESTER – VI**

S. No	Sub. Code	Name of the Subject	L	T	P	C
<b>THEORY</b>						
1	19155C61	Design of Steel Structural Elements	3	0	0	3
2	19155C62	Structural Analysis II	3	2	0	4
3	19155C63	Irrigation Engineering	3	0	0	3
4	19155C64	Highway Engineering	3	2	0	4
5	19155C65	Waste Water Engineering	3	0	0	3
6	19155E66	Elective II	3	0	0	3
<b>PRACTICALS</b>						
7	19155L67	Highway Engineering Laboratory	0	0	3	2
8	19155L68	Irrigation and Environmental Engineering Drawing	0	0	3	2

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

9	19155L69	Professional Communication	0	0	2	2
10	19155CBR	Participation in Bounded Research	0	0	2	2
TOTAL						28

**SEMESTER – VII**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



S. No	Sub. Code	Name of the Subject	L	T	P	C
<b>THEORY</b>						
1	19155C71	Estimation , Costing & Valuation Engineering	4	0	0	4
2	19155C72	Railways, Airports, Docks And Harbour Engineering	3	2	0	4
3	19155C73	Structural Design and drawing	3	2	0	4
4	19155FE74	Open Elective II	4	0	0	3
5	19155E75	Elective III	4	0	0	3
<b>PRACTICALS</b>						
6	19155L76	Creative and Innovation project (activity based – subject related)	0	0	4	2
7	19155L77	Industrial Training ( 4 Weeks during VI th Sem Summar)	0	0	0	2
8	19155L78	Technical Seminar	0	0	2	1
9	19155CSR	Design Project / Socio Technical Project(Participated Scaffolded Research )	0	0	4	4
TOTAL						27

**SEMESTER – VIII**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E81	Elective IV	3	0	0	3
2	19155E82	Elective V	3	0	0	3
3	19155PW83	Project Work	0	0	30	15
4	19155PEE	Program Exit Exam				2
TOTAL						23

**CREDITS DISTRIBUTION**

CGPA CREDITS

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

Semester	Core	Elective Courses	Open Electives	Practical	Seminar	Exit Exam	Project	RSD Course	Total
I	21	-	-	04	-	-	-	-	25
II	21	-	-	04	-	-	-	-	25
III	22	-	-	05	-	-	-	-	27
IV	22	-	-	05	-	-	-	01	28
V	14	03	03	06	-	-	-	03	29
VI	17	03	-	06	-	-	-	02	28
VII	12	03	03	04	01	-	-	04	27
VIII	-	06	-	-	-	02	15	-	23
<b>Total Credits</b>									<b>212</b>

#### NON CGPA CREDITS

Semester	Add on course	Total
I	01	01
II	01	01
In-plant Training , Industrial Visit , Seminars & Conferences		03
<b>TOTAL NON CGPA CREDITS</b>		<b>05</b>

TOTAL CREDITS	
CGPA CREDITS	<b>212</b>
NON CGPA CREDITS	<b>05</b>
<b>TOTAL</b>	<b>217</b>

**LIST OF ELECTIVES****SEMESTER – V****ELECTIVE I**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E55A	Digital Cadastre	3	0	0	3
2	19155E55B	Advanced Surveying	3	0	0	3
3	19155E55C	Geographic Information System	3	0	0	3
4	19155E55D	Geo informatics Applications for Civil Engineers	3	0	0	3

**SEMESTER – VI****ELECTIVE II**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E66A	Ground Improvement Techniques	3	0	0	3
2	19155E66B	Introduction to soil dynamics and machine foundation	3	0	0	3
3	19155E66C	Rock Engineering	3	0	0	3
4	19155E66D	Urban planning and development	3	0	0	3

**SEMESTER – VII****ELECTIVE III**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E75A	Traffic engineering and management	3	0	0	3
2	19155E75B	Design of Prestressed concrete structures	3	0	0	3
3	19155E75C	Construction planning and scheduling	3	0	0	3
4	19155E75D	Municipal solid waste management	3	0	0	3

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

**SEMESTER – VIII****ELECTIVE IV**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E81A	Coastal Engineering	3	0	0	3
2	19155E81B	Integrated water resources management	3	0	0	3
3	19155E81C	Groundwater engineering	3	0	0	3
4	19155E81D	Hydrology and water resources engineering	3	0	0	3

**ELECTIVE V**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19155E82A	Maintenance, repair and rehabilitation of structures	3	0	0	3
2	19155E82B	Structural dynamics and earthquake engineering	3	0	0	3
3	19155E82C	Prefabricated structures	3	0	0	3
4	19155E82D	Bridge engineering	3	0	0	3

**OPEN ELECTIVE-I**

1	19150FE54A	Database Management Systems (CSE)	3	0	0	3
2	19150FE54B	Cloud Computing (CSE)	3	0	0	3
3	19152FE54A	Basic Of Bio Medical Instrumentation (ECE)	3	0	0	3
4	19152FE54B	Sensor and Transducers (ECE)	3	0	0	3
5	19153FE54A	Industrial Nano Technology (EEE)	3	0	0	3
6	19153FE54A	Energy Conservation and Management (EEE)	3	0	0	3
7	19154FE54A	Renewable Energy Sources (MECH)	3	0	0	3
8	19154FE54B	Automotive Systems (MECH)	3	0	0	3

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

OPEN ELECTIVE-II

<b>1</b>	<b>19150FE74A</b>	<b>Introduction to C Programming (CSE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>2</b>	<b>19150FE74B</b>	<b>Data Structures &amp; Algorithms (CSE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>3</b>	<b>19152FE74A</b>	<b>Robotics (ECE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>4</b>	<b>19152FE74B</b>	<b>Electronic Devices (ECE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>5</b>	<b>19153FE74A</b>	<b>Basic Circuit Theory (EEE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>6</b>	<b>19153FE74B</b>	<b>Introduction to Renewable Energy Systems (EEE)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>7</b>	<b>19154FE74A</b>	<b>Industrial Safety (MECH)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>8</b>	<b>19154FE74B</b>	<b>Testing of Materials (MECH)</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**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 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-** 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.

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

**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 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.

**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, 43<sup>rd</sup> Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7<sup>th</sup> 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, 10<sup>th</sup> Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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", 12<sup>th</sup> 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:****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**

- Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
- Serway, R. A. & Jewett, J. W. "Physics for Scientists and Engineers" Cengage Learning, 2010
- Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics". W.H.Freeman, 2007.

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ENGINEERING CHEMISTRY

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**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 – H<sub>2</sub>-O<sub>2</sub> 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:**

- 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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**

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**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 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.

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

**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, 50<sup>th</sup> 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, 2<sup>nd</sup> 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.

**TEXT BOOKS:**

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2<sup>nd</sup> 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

**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.



**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
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 Na<sub>2</sub>CO<sub>3</sub> 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 (8<sup>TH</sup> 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 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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 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  $w = z + c$ ,  $c\bar{z}$ ,  $1/z$ ,  $z^2$  - 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, 43<sup>rd</sup> Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10<sup>th</sup> 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, 7<sup>th</sup> Edition, 2009.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3<sup>rd</sup> 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, 4<sup>th</sup> Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics" Tata McGraw Hill Education Pvt. Ltd, 6<sup>th</sup> Edition, New Delhi, 2012.

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

**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.

**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 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.

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

**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', 2<sup>nd</sup> 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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", McGraw Hill 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.



**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”, 8<sup>th</sup> 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”, 11<sup>th</sup> Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4<sup>th</sup> 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”, 3<sup>rd</sup> 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.

(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.

(d) Study of centrifugal pump

(e) Study of air conditioner

(f) Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of hexagonal headed bolt.

(g) Foundry operations like mould preparation for gear and step cone pulley.

(h) 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****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.

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

## 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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, 4<sup>th</sup> 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.

**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", 43<sup>rd</sup> 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", 9<sup>th</sup> Edition, Laxmi Publications Pvt. Ltd, 2014.

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

3. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10<sup>th</sup> Edition, John Wiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3<sup>rd</sup> 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.

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**STRENGTH OF MATERIALS I**

**L T P C**  
**3 2 0 4**

**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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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 Reinbhold, New Delhi 1999.
2. Vazirani.V.N and Ratwani.M.M, “Analysis of Structures”, Vol I Khanna Publishers, New Delhi,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 poiseuille'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.

**UNITII 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**

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, New Delhi, 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., 3<sup>rd</sup> Edition, 2004.
2. Guocheng Xu, "GPS Theory , Algorithms and Applications", Springer – Berlin, 2003.
3. SatheshGopi, 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.

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

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CONSTRUCTION MATERIALS

L T P C

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**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 McGraw Hill 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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 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**

<b>Sl.No.</b>	<b>Description of Equipment</b>	<b>Quantity</b>
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

**NUMERICAL METHODS**

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**OBJECTIVES :**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



- 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 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 :**

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", 9<sup>th</sup> Edition, Cengage Learning, 2016.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

2. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10<sup>th</sup> 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, 6<sup>th</sup> Edition, New Delhi, 2006.
3. Mathews, J.H. "Numerical Methods for Mathematics, Science and Engineering", 2<sup>nd</sup> Edition, Prentice Hall, 1992.
4. Sankara Rao. K., "Numerical Methods for Scientists and Engineers", Prentice Hall of India Pvt. Ltd, 3<sup>rd</sup> Edition, New Delhi, 2007.
5. Sastry, S.S, "Introductory Methods of Numerical Analysis", PHI Learning Pvt. Ltd, 5<sup>th</sup> 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 loaders, 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", 5<sup>th</sup> Edition, McGraw Hill, Singapore, 1995.
2. Arora S.P. and Bindra S.P., "Building Construction, Planning Techniques and Method of

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

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", 2<sup>nd</sup> edition, PHI Learning Pvt. Ltd., New Delhi,

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

**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., New Delhi, 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", 3<sup>rd</sup> Edition, Tata McGraw Hill Publishing Co Ltd, New Delhi, 2007
3. IS10262-2009 Recommended Guidelines for Concrete Mix Design, Bureau of Indian Standards, New Delhi, 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.

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

**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 – Boussines of theory – (Point load, Line load and udl) Use of Newmarks 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, 7<sup>th</sup> Edition, 2017(Reprint).
3. Gopal Ranjan, A S R Rao, “Basic and Applied Soil Mechanics” New Age International Publication, 3<sup>rd</sup> Edition, 2016.
4. Punmia, B.C., “Soil Mechanics and Foundations”, Laxmi Publications Pvt. Ltd. New Delhi, 16<sup>th</sup> Edition, 2017.

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



**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 India Pvt. Ltd. New Delhi, 2010.
3. Braja M Das, “Principles of Geotechnical Engineering”, Cengage Learning India Private Limited, 8<sup>th</sup> Edition, 2014.
4. Palanikumar.M., “Soil Mechanics”, Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi, 2013.
5. Craig.R.F., “Soil Mechanics”, E & FN Spon, London and New York, 2012.
6. Purushothama Raj. P., “Soil Mechanics and Foundations Engineering”, 2<sup>nd</sup> Edition, Pearson Education, 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

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

9. One set up of Francis turbines/one set of kaplon 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**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 University Press: 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 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

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

**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:**

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, New Delhi, 2013.
4. Krishnaraju.N “ Design of Reinforced Concrete Structures “, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
5. Ramachandra, “Limit state Design of Concrete Structures“ Standard Book House, New Delhi

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

**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 Hill Publishing 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, New Delhi, 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", Structures Publications, 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 strain energy method
- Analyze the continuous beams and rigid frames by slope deflection method.
- Understand the concept of moment distribution and analysis of continuous beams and rigid frames with and without sway.
- Analyze the indeterminate pin jointed plane frames continuous beams and rigid frames using matrix flexibility method.
- Understand the concept of matrix stiffness method and analysis of continuous beams, pin jointed trusses and rigid plane frames.

**TEXTBOOKS:**

1. Bhavikatti, S.S, Structural Analysis, Vol.1, & 2, Vikas Publishing House Pvt.Ltd., New Delhi-4, 2014.
2. Bhavikatti, S.S, Matrix Method of Structural Analysis, I. K. International Publishing House Pvt.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.and Gupta S.P., Structural Analysis – A Matrix Approach, Tata McGraw Hill Publishing Company 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

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



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", PHI Learning Pvt. Ltd, 2015
6. Negi L.S. and Jangid R.S., Structural Analysis, Tata McGraw Hill Publishing Co.Ltd. 2004.

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**WATER SUPPLY ENGINEERING**

**L T P C**

**3 0 0 3**

**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 – Clarifloccuator-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
- an ability to design the various functional units in water 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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, 7<sup>th</sup> Edition, 2017 (Reprint).
3. Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi, 16<sup>th</sup> Edition 2017.

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

**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 McGraw Hill publishing company Ltd., New Delhi, 2014.
3. Joseph E bowles, “Foundation Analysis and design”, McGraw Hill Education, 5<sup>th</sup> Edition, 28<sup>th</sup> 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

**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

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

14.	Weighing machine – 20kg capacity	1 No
15.	Weighing machine – 1kg capacity	3 No

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**WATER AND WASTE WATER ANALYSIS LABORATORY**

**L T P C**

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**COURSE OBJECTIVES:**

- To analyse the physical, chemical and biological characteristics of water and wastewater
- To quantify the dosage requirement for coagulation process
- To study the growth of micro-organism and its quantification
- To 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 treatment
- Examine 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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



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.

**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 but 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 lug 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 steel

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

beams.

**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 Steel Publications, 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](http://www.pearsoned.co.in/kssairam)
3. Shiyekar. M.R., "Limit State Design in Structural Steel", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2<sup>nd</sup> Edition, 2013
4. Bhavikatti.S.S, "Design of Steel Structures" By Limit State Method as per IS:800– 2007, IK International Publishing House Pvt. Ltd., 2009
5. Shah.V.L. and Veena Gore, "Limit State Design of Steel Structures", IS 800–2007, Structures Publications, 2009.
6. IS800 :2007, General Construction in Steel - Code of Practice, (Third Revision), Bureau of Indian Standards, 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 12**

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 12**

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 12**

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 12**

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 12**

Plastic theory – statistical 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., NewDelhi-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, PHIL earning 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, 16<sup>th</sup> Edition, New Delhi, 2009
3. Garg S. K., “Irrigation Engineering and Hydraulic structures”, Khanna Publishers, 23<sup>rd</sup> 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.

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

5. Michael A.M., Irrigation Theory and Practice, 2nd Edition, Vikas Publishing House Pvt. Ltd., Noida, Up, 2008
6. Asawa, G.L., "Irrigation Engineering", NewAge International Publishers, New Delhi, 2000.
7. Basak, N.N, "Irrigation Engineering", Tata McGraw Hill Publishing Co. New Delhi, 1999

**19155C64**

**HIGHWAY ENGINEERING**

**L T P C**  
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**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),

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

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IRC: 37-2012

2. Indian Road Congress (IRC), Guidelines for the Design of Plain Jointed Rigid Pavements for Highways, ( Third Revision), IRC: 58-2012
3. Yang H. Huang, "Pavement Analysis and Design", Pearson Education Inc, Ninth Impression, South Asia, 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 Engineering and Traffic Analysis", Wiley India Pvt. Ltd., New Delhi, 2011
6. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 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, New Delhi
9. IRC 58-2012. The Indian Road Congress, Guideline for the Design of Rigid Pavements for Highways, 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 pumping stations
- 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
- Gain knowledge on standard methods for disposal of sewage.
- Gain knowledge on sludge treatment and disposal.

**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.

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



**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 SKID RESISTANCE 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

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

**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-HillBook Co., 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

7. Qasim, S. R. "Wastewater Treatment Plants, Planning, Design & Operation", CRC Press, New York, 2010

19155C71

ESTIMATION, COSTING AND VALUATION ENGINEERING

L T P C  
4 0 0 4

**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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19155C72

**RAILWAYS, AIRPORTS, DOCKS AND HARBOUR ENGINEERING**

**L T P C**  
**3 2 0 4**

**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,

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

- 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

19155C73

STRUCTURAL DESIGN AND DRAWING

L T P C

3 2 0 4

**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 - IRC Specifications and Loading – RC Solid Slab Bridge – Steel Foot-over Bridge-design and drawing.

**UNIT III LIQUID STORAGE STRUCTURES 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 Tank

**Part 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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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

- Design and draw reinforced concrete Cantilever and Counterfort Retaining Walls
- Design and draw flat slab as per code provisions
- Design and draw reinforced concrete and steel bridges
- Design and draw reinforced concrete and steel water tanks
- 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 KumarJain,Comprehensive Design of Steel Structures, Laxmi Publications Pvt. Ltd., 2003.

#### REFERENCES:

1. Krishnamurthy D,Structural Design and Drawing Voll,IIandIII,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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

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
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.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP



19155L76

**CREATIVE AND INNOVATIVE PROJECT**  
(Activity Based - Subject Related)

**L T P C**  
**0 0 4 2**

**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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19155L77

**INDUSTRIAL TRAINING**  
(4 Weeks During VI Semester – Summer)

**L T P C**  
**0 0 0 2**

**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

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19155PW83

**PROJECT WORK**

**L T P C**  
**0 0 30 15**

**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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OBJECTIVE:**

- To introduce the students to the cadastral survey Methods and its applications in generation of Land information system.

**UNIT I INTRODUCTION 9**

History of cadastral survey - Types of survey - Tax - Real Property – Legal cadastre -Graphical and Numerical Cadastre, Legal Characteristics of Records, Torrens System.

**UNIT II CADASTRAL SURVEY METHODS 9**

Steps in survey of a village - Instruments used for cadastral survey & mapping - Orthogonal, Polar survey methods - Boundary survey - Rectangulation - Calculation of area of Land- GPS and Total Station in Cadastral survey.

**UNIT III PHOTOGRAMMETRIC METHODS 9**

Photogrammetry for cadastral surveying and mapping - Orthophoto map – Quality control measures - Organisation of cadastral offices – international scenario.

**UNIT IV CADASTRAL MAPPING AND LIS 9**

Cadastral map reproduction - Map projection for cadastral maps – Conventional symbols - map - reproduction processes - Automated cadastral map, Management of Digital Cadastral. Creation of Land Information System. Integrating LIS –Land administration.

**UNIT V MAINTENANCE AND MEASUREMENTS 9**

Cadastral survey maintenance - Resurveys - Measurement of sub-division - Measurement of obstructed lines - Survey of urban areas - Control requirement for Urban survey use of Satellite Imagery in boundary fixing.

**TOTAL: 45 PERIODS****OUTCOMES:**

On completion of this course students will be able to

- Gain knowledge about cadastre survey.
- Understand the methods of cadastral survey.
- Get the knowledge about photogrammetric methods.
- Understand Land Record System and computational procedure for modernization of the same.
- The students will be in position to understand the Government procedure in Land Record Management.

**TEXTBOOKS:**

1. Paul. R Wolf., Bon A. DeWitt, Elements of Photogrammetry with Application in GIS McGraw Hill International Book Co., 4th Edition, 2014
2. R.Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

**REFERENCES:**

1. Karl Kraus, Photogrammetry: Geometry from Images and Laser Scans, Walter de Gruyter GmbH & Co. 2nd Edition, 2007.
2. E. M. Mikhail, J. S. Bethel, J. C. McGlone, Introduction to Modern Photogrammetry, Wiley Publisher, 2001.
3. James, M. Anderson and Edward N. Mikhail, Introduction to Surveying, McGraw Hill Book Co, 1985.



**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

**OBJECTIVE:**

- To solve the Civil Engineering problems with the help of Geoinformatics technique.

**UNIT I      LAND RESOURCE MANAGEMENT      6**

Total Station and GPS Surveys – Topographic and Bathymetric Surveys – Cadastral Information – Soil and Land Use Surveys - Land Information System (LIS) – Real Estate Information System

**UNIT II      STRUCTURAL STUDIES      6**

Deformation studies of deflection - Dam deformation - structural movement - Pavement yield - shifting sand-bank and shoreline – Landslide Risk Analysis

**UNIT III      SOIL CONSERVATION AND MANAGEMENT      9**

Soil survey interpretation and mapping - impact of agricultural and industrial activity on soil properties - soil erosion - factors influencing soil erosion - soil contamination using Hyper spectral Remote Sensing - mining pollution- EMR responses with contaminated soil - modeling soil characteristics using satellite data - soil degradation assessment using Remote Sensing and GIS - Land reclamation studies

**UNIT IV      URBAN AND TRANSPORTATION MANAGEMENT      12**

Monitoring Urban Growth through Remote Sensing - Geo-demographic Analysis – Property Market Analysis Urban Renewal - traffic analysis - accident analysis - site suitability analysis for transport infrastructure –transportation databases: creation and maintenance - Vehicle routing – Highway maintenance system-Intelligent Transportation System.

**UNIT V      WATER RESOURCES PLANNING AND MANAGEMENT      12**

Location of storage/diversion works – capacity curve generation – sediment yield - modelling of catchments – Delineation of watershed - Watershed modelling for sustainable development - Rainfall – Runoff modelling –LiDAR Mapping for Urban area –Water quality mapping and monitoring – Flood Risk Zoning - Flood damage assessment – Flood Modelling - Assessment of droughts and mitigation

**TOTAL: 45 PERIODS**

**OUTCOMES:**

On completion of this course students will be able to

- Get knowledge about the land resource management.
- Study structural deformation and movement.
- Model soil characteristics, soil degradation assessment and management.
- Monitor urban growth and management of transport infrastructure.
- Model catchments and management of water resources.

**TEXTBOOKS:**

1. Basudeb Bhatta, 'Remote Sensing and GIS', Second edition, Oxford University Press 2011.
2. Lo.C.P., Albert K.W.Yeung, Concepts and Techniques of Geographic Information Systems, Second edition, PHI Learning Private Limited, Delhi, 2014.

**REFERENCES:**

1. Andrew N. Rencz, Manual of Remote Sensing: Remote Sensing for Natural Resource Management and Environmental Monitoring, John Wiley & Sons Inc, April 2004
2. Rashed, Tarek; Jürgens, Carsten (Eds.), Remote Sensing of Urban and Suburban Areas, Springer, 1st Edition. 2010.
3. Harvey J. Miller, Shih-Lung Shaw, Geographic Information Systems for Transportation – Principles and Applications, Oxford University Press, 2001.
4. Gert A. Schulitz Edwin T. Engman, Remote Sensing in hydrology and Water Management, Springer - verlag Berlin Heidelberg Germany - 2000.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OBJECTIVE:**

- Students will be exposed to various problems associated with soil deposits and methods to evaluate them. The different techniques will be taught to them to improve the characteristics of difficult soils as well as design techniques required to implement various ground improvement methods.

**UNIT I PROBLEMATIC SOIL AND IMPROVEMENT TECHNIQUES 8**

Role of ground improvement in foundation engineering – Methods of ground improvement – Geotechnical problems in alluvial, lateritic and black cotton soils – Selection of suitable ground improvement techniques based on soil conditions.

**UNIT II DEWATERING 10**

Dewatering Techniques - Well points – Vacuum and electroosmotic methods – Seepage analysis for two dimensional flow for fully and partially penetrated slots in homogeneous deposits – Design for simple cases.

**UNIT III INSITU TREATMENT OF COHESIONLESS AND COHESIVE SOILS 10**

Insitu densification of cohesionless soils – Shallow as deep compaction – Dynamic compaction - Vibroflotation, Sand compaction piles and deep compaction. Consolidation of cohesionless soils - Preloading with sand drains, and fabric drains, Stabilization of soft clay ground using stone columns and Lime piles-Installation techniques – Simple design - Relative merits of above methods and their limitations.

**UNIT IV EARTH REINFORCEMENT 9**

Concept of reinforcement – Types of reinforcement material – Reinforced earth wall – Mechanism – Simple design - Applications of reinforced earth; Functions of Geotextiles in filtration, drainage, separation, road works and containment applications.

**UNIT V GROUTING TECHNIQUES 8**

Types of grouts – Grouting equipments and machinery – Injection methods – Grout monitoring – Stabilization with cement, lime and chemicals – Stabilization of expansive soil.

**TOTAL: 45 PERIODS****OUTCOMES:**

At the end of the course the student will be able to

- Gain knowledge on methods and selection of ground improvement techniques.
- Understand dewatering techniques and design for simple cases.
- Get knowledge on insitu treatment of cohesionless and cohesive soils.
- Understand the concept of earth reinforcement and design of reinforced earth.
- Get to know types of grouts and grouting technique.

**TEXTBOOKS:**

1. Purushothama Raj. P, “Ground Improvement Techniques”, Lakshmi Publications, 2<sup>nd</sup> Edition, 2016.
2. Koerner, R.M. “Construction and Geotechnical Methods in Foundation Engineering”, McGraw Hill, 1994.
3. Nihar Ranjan Patra, “Ground Improvement Techniques”, Vikas Publishing House, First Edition, 2012.
4. Mittal.S, “An Introduction to Ground Improvement Engineering”, Medtech Publisher, First Edition, 2013.

**REFERENCES:**

1. Moseley, M.P., “Ground Improvement” Blockie Academic and Professional, 1992.
2. Moseley, M.P and Kirsch. K., ‘Ground Improvement’, Spon Press, Taylor and Francis Group, London, 2<sup>nd</sup> Edition, 2004.
3. Jones C.J.F.P. “Earth Reinforcement and Soil Structure”, Thomas Telford Publishing, 1996.
4. Winterkorn, H.F. and Fang, H.Y. “Foundation Engineering Hand Book”. Van Nostrand Reinhold, 1994.
5. Das, B.M., “Principles of Foundation Engineering” (seventh edition), Cengage learning, 2010.
6. Coduto, D.P., “Geotechnical Engineering – Principles and Practices”, Prentice Hall of India Pvt.Ltd. New Delhi, 2011.
7. Koerner, R.M., “Designing with Geosynthetics” (Sixth Edition), Xlibris Corporation, U.S.A, 2012.
8. IS Code 9759 : 1981 (Reaffirmed 1998) “Guidelines for Dewatering During Construction”, Bureau of Indian Standards, New Delhi.
9. IS Code 15284 (Part 1): 2003 “Design and Construction for Ground Improvement – Guidelines” (Stone

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



Column), Bureau of Indian Standards, New Delhi.

**19155E66B INTRODUCTION TO SOIL DYNAMICS AND MACHINE FOUNDATIONS**

**L T P C**  
**3 0 0 3**

**OBJECTIVE:**

- To understand the basics of soil dynamics – dynamic behaviour of soils – effects of dynamic loads and the various design methods.

**UNIT I THEORY OF VIBRATION 9**

Introduction – Nature dynamic loads – Vibrations of single degree freedom system – Free vibrations of spring – mass systems – Forced vibrations – Viscous damping - Transmissibility – Principles of vibration measuring instruments – Effect of Transient and Pulsating loads.

**UNIT II WAVE PROPAGATION 9**

Elastic waves in rods of infinite length – Longitudinal and Torsional – Effect of end conditions – Longitudinal and torsional vibrations of rods of finite length – Wave Propagation in infinite, homogeneous isotropic and elastic medium - Wave propagation in elastic half space – Typical values of compress wave and shear wave velocity – Wave propagation due to Machine foundation– Surface wave – Typical values – Particle movements and velocity.

**UNIT III DYNAMIC PROPERTIES OF SOILS 9**

Dynamic stress – Strain characteristics – Principles of measuring dynamic properties – Laboratory Techniques – Field tests – Factors affecting dynamic properties – Typical values – Dynamic bearing capacity – Dynamic earth pressure.

**UNIT IV FOUNDATION FOR DIFFERENT TYPES OF MACHINES 9**

Types of machines and foundation – General requirements – Modes of vibration of a rigid foundation – Method of analysis – Linear elastic weightless spring method – Elastic half space method – Analog Method – Design of block foundation – Special consideration for rotary, Impact type of machines – Codal Provisions.

**UNIT V INFLUENCE OF VIBRATION AND REMEDIATION 9**

Mechanism of Liquefaction – Influencing factors – Evaluation of Liquefaction potential based on SPT-Force Isolation – Motion Isolation – Use of spring and damping materials – Vibration control of existing machine foundation – Screening of vibration – Open trenches – Pile Barriers – Salient construction aspects of machine Foundations.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course the student will be able to

- Understand the theory and measurement of vibration.
  - Understand the concept of wave propagation in infinite medium and due to machine foundation.
  - Get knowledge on dynamic properties of soils and laboratory and field testing.
  - Design of foundation for different types of machines
  - Understand liquefaction, motion isolation and vibration control.
1. Swamisaran, “Soil Dynamics and Machine Foundations”, Galgotia Publications Pvt.Ltd. New Delhi-110002, 3<sup>rd</sup> Edition 2016.
  2. Kameswara Rao., “Dynamics Soil Tests and Applications”, Wheeler Publishing, New Delhi, 2003.
  3. P. Srinivasulu, and C.V. Vaidyanathan, “Handbook of Machine Foundations”, Tata McGraw-Hill, 2007

**REFERENCES:**

1. Kamaswara Rao., “Vibration Analysis and Foundation Dynamics”, Wheeler Publishing, New Delhi, 1998.
2. IS Code of Practice for Design and Construction of Machine Foundations, McGrew Hill, 1996.
3. Moore, P.J., “Analysis and Design of Foundation for Vibration”, Oxford and IBH, 2005
4. Steven L. Kramer, “Geotechnical Earthquake Engineering”, Prentice Hall, 1996.
5. IS Code 5249: 1992 (Reaffirmed 2006) “Determination of Dynamic Properties of Soil – Method of Test” Bureau of Indian Standards, New Delhi.
6. IS Code 2974: (Part 1) 1982 (Reaffirmed 2008) “Code of Practice for Design and Construction of Machine Foundations - Foundation for Reciprocating Type Machines” Bureau of Indian Standards, New Delhi.
7. IS Code 2974: (Part 2) 1980 (Reaffirmed 2008) “Code of Practice for Design and Construction of Machine Foundations - Foundations for Impact Type Machines (Hammer Foundations)” Bureau of Indian Standards, New Delhi.
8. IS Code 2974: (Part 3) 1992 (Reaffirmed 2006) “Code of Practice for Design and

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19155E66C

ROCK ENGINEERING

L T P C  
3 0 0 3

**OBJECTIVE:**

- To impart knowledge on fundamentals of rock mechanics and its application in solving simple problems associated with rock slopes and underground openings. Student gains the knowledge on the mechanics of rock and its applications in underground structures and rock slope stability analysis.

**UNIT I CLASSIFICATION AND INDEX PROPERTIES OF ROCKS 6**  
Geological classification – Index properties of rock systems – Classification of rock masses for engineering purpose – Rock Mass Rating and Q System.

**UNIT II ROCK STRENGTH AND FAILURE CRITERIA 12**  
Modes of rock failure – Strength of rock – Laboratory measurement of shear, tensile and compressive strength. Stress - strain behaviour of rock under Hydrostatic compression and deviatoric loading – Mohr –Coulomb failure criteria and Hock and Brown empirical criteria

**UNIT III INITIAL STRESSES AND THEIR MEASUREMENTS 10**  
Estimation of initial stresses in rocks – influence of joints and their orientation in distribution of stresses – measurements of in-situ stresses – Hydraulic fracturing – Flat jack method – Over coring method

**UNIT IV APPLICATION OF ROCK MECHANICS IN ENGINEERING 10**  
Simple engineering application – Underground openings – Rock slopes – Foundations and mining subsidence.

**UNIT V ROCK STABILISATION 7**  
Introduction – Rock support and Rock reinforcement – Principles – Support reaction curves – Shotcreting.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course the student will be able to

- Classify the rocks, study the index properties of rock systems.
- Understand the modes of rock failure, stress-strain characteristics, failure criteria.
- Estimate the stresses in rocks.
- Apply rock mechanics in engineering.
- Get knowledge on rock stabilization.

**TEXTBOOKS:**

1. Goodman, P.E. "Introduction to Rock Mechanics", John Wiley and Sons, 1999.
2. Stillborg B., "Professional User Handbook for rock Bolting", Tran Tech Publications, 1996.
3. Ramamurthy T., "Engineering in Rocks for Slopes Foundations and Tunnels", PHI Learning Pvt. Ltd., 3<sup>rd</sup> Edition, 2014.

**REFERENCES:**

1. Brown, E.T. "Rock Characterisation Testing and Monitoring". Pergaman Press 1991.
2. Arogyaswamy, R.N.P., "Geotechnical Application in Civil Engineering", Oxford and IBH, 1991.
3. Brady, B.H.G. and Brown, E.T., "Rock mechanics for underground mining (Third Edition), Kluwer Academic Publishers, Dordrecht, 2006.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OBJECTIVE:**

- To enable students to have the knowledge on planning process and to introduce to the students about the regulations and laws related to Urban Planning.

**UNIT I BASIC ISSUES 8**  
Definition of Human settlement, Urban area, Town, City, Urbanisation, Suburbanisation, Urban sprawl, Peri - urban areas, Central Business District (CBD), Classification of urban areas – Trend of Urbanisation at International, National, Regional and State level.

**UNIT II PLANNING PROCESS 8**  
Principles of Planning – Types and Level of Plan, Stages in Planning Process – Goals, Objectives, delineation of Planning Areas, Surveys and Questionnaire Design.

**UNIT III DEVELOPMENT PLANS, PLAN FORMULATION AND EVALUATION 10**  
Scope and Content of Regional Plan, Master Plan, Detailed Development Plan, Development Control Rules, Transfer of Development Rights , Special Economic Zones- Development of small town and smart cities-case studies

**UNIT IV PLANNING AND DESIGN OF URBAN DEVELOPMENT PROJECTS 9**  
Site Analysis, Layout Design, Planning Standards, Project Formulation – Evaluation, Plan Constraints and Implementation, Financing of Urban Development Projects.

**UNIT V LEGISLATION, DEVELOPMENT AND MANAGEMENT OF URBAN SYSTEM 10**  
Town and Country Planning Act, Land Acquisition and Resettlement Act etc., Urban Planning Standards and Regulations, Involvement of Public, Private, NGO, CBO and Beneficiaries.

**TOTAL : 45 PERIODS****OUTCOMES:**

The students completing the course will have the ability to

- Describe basic issues in urban planning
- Formulate plans for urban and rural development and
- Plan and analyse socio economic aspects of urban and rural planning
- Design of urban development projects.
- Manage urban development projects.

**TEXTBOOKS:**

1. Goel, S.L Urban Development and Management, Deep and Deep publications, New Delhi 2002
2. George Chadwick, A Systems view of planning, Pergamon press, Oxford 1978
3. Singh V.B, Revitalised Urban Administration in India, Kalpaz publication, Delhi, 2001
4. Edwin S.Mills and Charles M.Becker, Studies in Urban development, A World Bank publication, 1986

**REFERENCES:**

1. Tamil Nadu Town and Country Planning Act 1971, Government of Tamil Nadu, Chennai
2. Goel S.L., Urban Development and Management, Deep and Deep Publications, New Delhi, 2002
3. Thooyavan, K.R., Human Settlements – A Planning Guide to Beginners, M.A Publications, Chennai, 2005
4. CMDA, Second Master Plan for Chennai, Chennai 2008

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

**OBJECTIVE:**

- To give an overview of Traffic engineering, traffic regulation, management and traffic safety with integrated approach in traffic planning as well.

**UNIT I TRAFFIC PLANNING AND CHARACTERISTICS 12**

Road Characteristics – Road user characteristics – PIEV theory – Vehicle – Performance characteristics – Fundamentals of Traffic Flow – Urban Traffic problems in India – Integrated planning of town ,country ,regional and all urban infrastructure – Towards Sustainable approach. – land use & transport and modal integration.

**UNIT II TRAFFIC SURVEYS 12**

Traffic Surveys – Speed, journey time and delay surveys – Vehicles Volume Survey including nonmotorized transports – Methods and interpretation – Origin Destination Survey – Methods and presentation – Parking Survey – Accident analyses -Methods, interpretation and presentation – Statistical applications in traffic studies and traffic forecasting – Level of service – Concept, applications and significance.

**UNIT III TRAFFIC DESIGN AND VISUAL AIDS 12**

Intersection Design - channelization, Rotary intersection design – Signal design – Coordination of signals – Grade separation - Traffic signs including VMS and road markings – Significant roles of traffic control personnel - Networking pedestrian facilities & cycle tracks.

**UNIT IV TRAFFIC SAFETY AND ENVIRONMENT 12**

Road accidents – Causes, effect, prevention, and cost – Street lighting – Traffic and environment hazards – Air and Noise Pollution, causes, abatement measures – Promotion and integration of public transportation – Promotion of non-motorized transport.

**UNIT V TRAFFIC MANAGEMENT 12**

Area Traffic Management System - Traffic System Management (TSM) with IRC standards –Traffic Regulatory Measures-Travel Demand Management (TDM) – Direct and indirect methods –Congestion and parking pricing – All segregation methods- Coordination among different agencies – Intelligent Transport System for traffic management, enforcement and education.

**TOTAL: 60 PERIODS****OUTCOMES:**

On completing this course, the Students will be able to

- Analyse traffic problems and plan for traffic systems various uses
- Design Channels, Intersections, signals and parking arrangements
- Develop Traffic management Systems.

**TEXTBOOKS:**

1. Kadiyali.L.R. "Traffic Engineering and Transport Planning", Khanna Publishers, Delhi, 2013
2. Indian Roads Congress (IRC) Specifications: Guidelines and Special Publications on Traffic Planning and Management.
3. Salter. R.I and Hounsell N.B, "Highway Traffic Analysis and design", Macmillan Press Ltd. 1996.

**REFERENCES:**

1. Fred L. Mannering, Scott S. Washburn and Walter P.Kilareski, Principles of Highway Engineering and Traffic Analysis, Wiley India Pvt. Ltd., New Delhi, 2011
2. Garber and Hoel, "Principles of Traffic and Highway Engineering", CENGAGE Learning, New Delhi, 2010
3. SP:43-1994, IRC Specification, "Guidelines on Low-cost Traffic Management Techniques" for Urban Areas, 1994
4. John E Tyworth, "Traffic Management Planning, Operations and control", Addison Wesley

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

- Publishing Company, 1996
5. Hobbs.F.D. "Traffic Planning and Engineering", University of Birmingham, Peragamon Press Ltd, 2005
  6. Taylor MAP and Young W, "Traffic Analysis – New Technology and New Solutions", Hargreen Publishing Company, 1998.

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**DESIGN OF PRESTRESSED CONCRETE STRUCTURES**

**L T P C  
4 0 0 4**

**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 (IS 1343).
- 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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

**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.
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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 India Pvt. 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 make the students to learn about planning of construction projects, scheduling procedures and techniques, cost and quality control projects and use of project information as decision making tool.

**UNIT I CONSTRUCTION PLANNING 12**

Basic concepts in the development of construction plans-Choice of Technology and Construction method-Defining Work Tasks- Work breakdown structure- Definition- Precedence relationships among activities-Estimating Activity Durations-Estimating Resource Requirements for work activities-coding systems.

**UNIT II SCHEDULING PROCEDURES AND TECHNIQUES 12**

Relevance of construction schedules-Bar charts - The critical path method-Calculations for critical path scheduling-Activity float and schedules-Presenting project schedules-Critical path scheduling for Activity-on-node and with leads, Lags and Windows-Calculations for scheduling with leads,lags and windows-Resource oriented scheduling-Scheduling with resource constraints and precedences -Use of Advanced Scheduling Techniques-Scheduling with uncertain durations-Crashing and time/cost tradeoffs -Improving the Scheduling process – Introduction to application software.

**UNIT III COST CONTROL MONITORING AND ACCOUNTING 12**

The cost control problem-The project budget-Forecasting for Activity cost control - financial accounting systems and cost accounts-Control of project cash flows-Schedule control-Schedule and Budget updates-Relating cost and schedule information.

**UNIT IV QUALITY CONTROL AND SAFETY DURING CONSTRUCTION 12**

Quality and safety Concerns in Construction-Organizing for Quality and Safety-Work and Material Specifications-Total Quality control-Quality control by statistical methods -Statistical Quality control with Sampling by Attributes-Statistical Quality control by Sampling and Variables-Safety.

**UNIT V ORGANIZATION AND USE OF PROJECT INFORMATION 12**

Types of project information-Accuracy and Use of Information-Computerized organization and use of Information - Organizing information in databases-relational model of Data bases-Other conceptual Models of Databases-Centralized database Management systems-Databases and application programs-Information transfer and Flow.

**TOTAL: 60 PERIODS****OUTCOMES:**

The students completing the course will have ability to

- Understand basic concepts of construction planing.
- Schedule the construction activities.
- Forecast and control the cost in a construction.
- Understand the quality control and safety during construction.
- Organize information in Centralized database Management systems.

**TEXTBOOKS:**

1. Chitkara, K.K. “Construction Project Management Planning”, Scheduling and Control, Tata McGraw Hill Publishing Co., New Delhi, 2009
2. Srinath,L.S., “Pert and CPM Principles and Applications“, Affiliated East West Press, 2001

**REFERENCES:**

1. Chris Hendrickson and Tung Au, “Project Management for Construction – Fundamentals Concepts for Owners”, Engineers, Architects and Builders, Prentice Hall, Pittsburgh, 2000.
2. Moder.J., Phillips. C. and Davis E, “Project Management with CPM”, PERT and Precedence Diagramming, Van Nostrand Reinhold Co., 3rd Edition, 1985.
3. Willis., E.M., “Scheduling Construction projects”, John Wiley and Sons, 1986.
4. Halpin,D.W., “Financial and Cost Concepts for Construction Management”, John Wiley and Sons, New York, 1985.

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



**OBJECTIVE:**

- To make the students conversant with the types, sources, generation, storage, collection, transport, processing and disposal of municipal solid waste.

**UNIT I SOURCES AND CHARACTERISTICS 12**

Sources and types of municipal solid wastes- Public health and environmental impacts of improper disposal of solid wastes- sampling and characterization of wastes - factors affecting waste generation rate and characteristics - Elements of integrated solid waste management – Requirements and salient features of Solid waste management rules (2016) — Role of public and NGO"s- Public Private participation – Elements of Municipal Solid Waste Management Plan.

**UNIT II SOURCE REDUCTION , WASTE STORAGE AND RECYCLING 12**

Waste Management Hierarchy - Reduction, Reuse and Recycling - source reduction of waste – On-site storage methods – Effect of storage, materials used for containers – segregation of solid wastes – Public health and economic aspects of open storage – case studies under Indian conditions – Recycling of Plastics and Construction/Demolition wastes.

**UNIT III COLLECTION AND TRANSFER OF WASTES 12**

Methods of Residential and commercial waste collection – Collection vehicles – Manpower – Collection routes – Analysis of waste collection systems; Transfer stations –location, operation and maintenance; options under Indian conditions – Field problems- solving.

**UNIT IV PROCESSING OF WASTES 12**

Objectives of waste processing – Physical Processing techniques and Equipment; Resource recovery from solid waste composting and biomethanation; Thermal processing options – case studies under Indian conditions.

**UNIT V WASTE DISPOSAL 12**

Land disposal of solid waste- Sanitary landfills – site selection, design and operation of sanitary landfills – Landfill liners – Management of leachate and landfill gas- Landfill bioreactor – Dumpsite Rehabilitation

**TOTAL: 60 PERIODS****OUTCOMES:**

The students completing the course will demonstrate

- understanding of the nature and characteristics of municipal solid wastes and the regulatory requirements regarding municipal solid waste management.
- Reduction, reuse and recycling of waste.
- ability to plan and design systems for storage, collection, transport, processing and disposal of municipal solid waste.
- knowledge on the issues on solid waste management from an integrated and holistic perspective, as well as in the local and international context.
- Design and operation of sanitary landfill.

**TEXTBOOKS:**

1. William A. Worrell, P. Aarne Vesilind (2012) Solid Waste Engineering, Cengage Learning, 2012.
2. John Pitchel (2014), Waste Management Practices-Municipal, Hazardous and industrial – CRC Press, Taylor and Francis, New York.

**REFERENCES:**

1. CPHEEO (2014), "Manual on Municipal Solid waste management, Central Public Health and Environmental Engineering Organisation , Government of India, New Delhi.
2. George Tchobanoglous and Frank Kreith (2002). Handbook of Solid waste management, McGraw Hill, New York.

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

**OBJECTIVES:**

- The main purpose of coastal engineering is to protect harbors and improve navigation.
- The students to the diverse topics as wave mechanics, wave climate, shoreline protection methods and laboratory investigations using model studies.

**UNIT I INTRODUCTION TO COASTAL ENGINEERING 9**

Indian Scenario - Classification of Harbours. Introduction - wind and waves - Sea and Swell - Introduction to small amplitude wave theory - use of wave tables- Mechanics of water waves - Linear (Airy) wave theory, Introduction to Tsunami

**UNIT II WAVE PROPERTIES AND ANALYSIS 9**

Behaviour of waves in shallow waters, Introduction to non-linear waves and their properties - Waves in shallow waters - Wave Refraction, Diffraction and Shoaling -Hindcast wave generation models, wave shoaling; wave refraction; wave breaking; wave diffraction random and 3D waves-Short term wave analysis - wave spectra and its utilities - Long term wave analysis- Statistics analysis of grouped wave data.

**UNIT III COASTAL SEDIMENT TRANSPORT 9**

Dynamic beach profile; cross-shore transport; along shore transport (Littoral transport), sediment movement

**UNIT IV COASTAL DEFENSE 9**

Field measurement; models, groins, sea walls, offshore breakwaters, artificial nourishment - planning of coast protection works - Design of shore defense structures

**UNIT V MODELING IN COASTAL ENGINEERING 9**

Physical modeling in Coastal Engineering - Limitations and advantages - Role of physical modeling in coastal engineering - Numerical modeling - Modeling aspects - limitations - Tsunami mitigation measures –

**TOTAL: 45 PERIODS**

**OUTCOMES:**

The students will be able to

- Understand coastal engineering aspects of harbors methods to improve navigation
- Understand the wave properties and analysis of wave.
- Understand the concepts of sediment transport.
- Design of shore defense structures.
- Gain knowledge in modeling in coastal engineering.

**REFERENCES:**

1. Mani J.S., Coastal Hydrodynamics. PHI Pvt. Ltd. New Delhi - 2012.
2. Dean, R.G. and Dalrymple, R.A., Water wave mechanics for Engineers and Scientists, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1994.
3. Ippen, A.T., Estuary and Coastline Hydrodynamics, McGraw-Hill, Inc., New York, 1978.
4. Sorenson, R.M., Basic Coastal Engineering, A Wiley-Interscience Pub. New York, 1978.
5. Coastal Engineering Manual, Vol. I-VI, Coastal Engineering Research Centre, Dept. of the Army, US Army Corps of Engineers, Washington DC, 2006.

**OBJECTIVES:**

- To introduce the students to the interdisciplinary analysis of water and conceptual design of intervention strategies.
- To develop a knowledge-base on capacity building on IWRM.

**UNIT I IWRM FRAMEWORK 9**

Definition-objective-principles-evaluation of IWRM- IWRM relevance in water resources management- paradigm shift: process and prospective outcomes

**UNIT II CONTEXTUALIZING 9**

UN formulations - SDG goals - IWRM in Global, Regional and Local Institutional transformation - Bureaucratic reforms - Inclusive development

**UNIT III EMERGING ISSUES IN WATER MANAGEMENT 9**

Emerging Issues — Drinking water management in the context of climate change - IWRM and irrigation - Flood – Drought – Pollution – Linkages between water, health and poverty

**UNIT IV IWRM AND WATER RESOURCES DEVELOPMENT IN INDIA 9**

Rural Development - Ecological sustainability- -Watershed development and conservation - Ecosystem regeneration – Wastewater reuse - Sustainable livelihood - Food security

**UNIT V ASPECTS OF INTEGRATED DEVELOPMENT 9**

Capacity building - Conceptual framework of IWRM – Problems and policy issues - Solutions for effective integrated water management - Case studies

**TOTAL: 45 PERIODS****OUTCOMES:**

The students will be able to

- Understand objectives, principles and evolution of integrated water resources management.
- Have an idea of contextualizing IWRM
- Gain knowledge in emerging issues in water management, flood, drought, pollution and poverty.
- Understand the water resources development in India and wastewater reuse.
- Gain knowledge on integrated development of water management.

**TEXTBOOKS:**

1. Mollinga P. *et al.* “Integrated Water Resources Management”, Water in South Asia Volume I, Sage Publications, 2006.
2. Sithamparamathan, Rangasamy, A., and Arunachalam, N., “Ecosystem Principles and Sustainable Agriculture”, Scitech Publications (India) Pvt.Lt, Chennai, 1999.

**REFERENCES:**

1. Cech Thomas V., Principles of Water Resources: History, Development, Management and Policy. John Wiley and Sons Inc., New York. 2003.
2. Murthy, J.V.S., “Watershed Management in India”, Wiley Eastern Ltd., New York, 1995.
3. Dalte, S.J.C., “Soil Conservation and Land Management”, International Book Distribution, India, 1986.

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

**OBJECTIVES:**

- To introduce the student to the principles of Groundwater governing Equations and Characteristics of different aquifers,
- To understand the techniques of development and management of groundwater.

**UNIT I HYDROGEOLOGICAL PARAMETERS 9**

Introduction – Water bearing Properties of Rock – Type of aquifers - Aquifer properties – permeability, specific yield, transmissivity and storage coefficient – Methods of Estimation – GEC norms - Steady state flow - Darcy's Law - Groundwater Velocity – Dupuit Forchheimer assumption – Steady Radial Flow into a Well

**UNIT II WELL HYDRAULICS 9**

Unsteady state flow - Theis method - Jacob method – Chow's method – Law of Times – Theis Recovery – Bailer method – Slug method - tests - Image well theory – Partial penetrations of wells – Well losses – Specific Capacity and Safe yield - Collector well and Infiltration gallery

**UNIT III GROUNDWATER MANAGEMENT 9**

Need for Management Model – Database for Groundwater Management – Groundwater balance study – Introduction to Mathematical model – Model Conceptualization – Initial and Boundary Condition – Calibration – Validation – Future Prediction – Sensitivity Analysis – Uncertainty – Development of a model

**UNIT IV GROUNDWATER QUALITY 9**

Ground water chemistry - Origin, movement and quality - Water quality standards – Drinking water – Industrial water – Irrigation water - Ground water Pollution and legislation - Environmental Regulatory requirements.

**UNIT V GROUNDWATER CONSERVATION 9**

Artificial recharge techniques – Reclaimed wastewater recharge – Soil aquifer treatment (SAT) – Aquifer Storage and Recovery (ASR) Seawater Intrusion and Remediation – Ground water Basin management and Conjunctive use – Protection zone delineation, Contamination source inventory and remediation schemes

**TOTAL: 45 PERIODS****OUTCOMES:**

The students will be able to

- Understand aquifer properties and its dynamics
- Get an exposure towards well design and practical problems
- Develop a model for groundwater management.
- Students will be able to understand the importance of artificial recharge and groundwater quality concepts
- Gain knowledge on conservation of groundwater.

**TEXTBOOKS:**

1. Raghunath H.M., "Ground Water Hydrology", New Age International (P) Limited, New Delhi, 2010.
2. Todd D.K., "Ground Water Hydrology", John Wiley and Sons, New York, 2000.

**REFERENCES:**

1. Fitts R Charles, "Groundwater Science". Elsevier, Academic Press, 2002.
2. Ramakrishnan, S, Ground Water, K.J. Graph arts, Chennai, 1998.

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

**OBJECTIVE:**

- To introduce the student to the concept of hydrological aspects of water availability and requirements and should be able to quantify, control and regulate the water resources.

**UNIT I      PRECIPITATION AND ABSTRACTIONS      10**

Hydrological cycle- Meteorological measurements – Requirements, types and forms of precipitation - Rain gauges-Spatial analysis of rainfall data using Thiessen and Isohyetal methods-Interception - Evaporation, Horton's equation, pan evaporation measurements and evaporation suppression - Infiltration-Horton's equation - double ring infiltrometer, infiltration indices.

**UNIT II      RUNOFF      8**

Watershed, catchment and basin - Catchment characteristics - factors affecting runoff - Run off estimation using empirical - Strange's table and SCS methods – Stage discharge relationships-flow measurements-Hydrograph – Unit Hydrograph – IUH

**UNIT III      FLOOD AND DROUGHT      9**

Natural Disasters-Flood Estimation- Frequency analysis- Flood control- Definitions of droughts-Meteorological, hydrological and agricultural droughts- IMD method-NDVI analysis- Drought Prone Area Programme (DPAP)

**UNIT IV      RESERVOIRS      8**

Classification of reservoirs, General principles of design, site selection, spillways, elevation – area - capacity - storage estimation, sedimentation - life of reservoirs – rule curve

**UNIT V      GROUNDWATER AND MANAGEMENT      10**

Origin- Classification and types - properties of aquifers- governing equations – steady and unsteady flow - artificial recharge - RWH in rural and urban areas

**TOTAL: 45 PERIODS****OUTCOMES:**

The students completing the course will have

- an understanding of the key drivers on water resources, hydrological processes and their integrated behaviour in catchments,
- ability to construct and apply a range of hydrological models to surface water and groundwater problems including Hydrograph, Flood/Drought management, artificial recharge
- ability to conduct Spatial analysis of rainfall data and design water storage reservoirs
- Understand the concept and methods of ground water management.

**TEXTBOOKS:**

1. Subramanya .K. "Engineering Hydrology"- Tata McGraw Hill, 2010
2. Jayarami Reddy .P. "Hydrology", Tata McGraw Hill, 2008.
3. Linsley, R.K. and Franzini, J.B. "Water Resources Engineering", McGraw Hill International Book Company, 1995.

**REFERENCES:**

1. David Keith Todd. "Groundwater Hydrology", John Wiley & Sons, Inc. 2007
2. Ven Te Chow, Maidment, D.R. and Mays, L.W. "Applied Hydrology", McGraw Hill International Book Company, 1998.
3. Raghunath .H.M., "Hydrology", Wiley Eastern Ltd., 1998.

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

**OBJECTIVE:**

- To acquire the knowledge on Quality of concrete, durability aspects, causes of deterioration, assessment of distressed structures, repairing of structures and demolition procedures.

**UNIT I MAINTENANCE AND REPAIR STRATEGIES 9**

Maintenance, Repair and Rehabilitation, Facets of Maintenance, importance of Maintenance, Various aspects of Inspection, Assessment procedure for evaluating damaged structure, causes of deterioration.

**UNIT II STRENGTH AND DURABILITY OF CONCRETE 9**

Quality assurance for concrete–Strength, Durability- Cracks, different types, causes–Effects due to climate, temperature, Sustained elevated temperature, Corrosion

**UNIT III SPECIAL CONCRETES 9**

Polymer concrete, Sulphur infiltrated concrete, Fibre reinforced concrete, High strength concrete, High performance concrete, Vacuum concrete, Self compacting concrete, Geopolymer concrete, Reactive powder concrete, Concrete made with industrial wastes.

**UNIT IV TECHNIQUES FOR REPAIR AND PROTECTION METHODS 9**

Non-destructive Testing Techniques, Load Test for Stability-Epoxy injection, Shoring, Underpinning, Corrosion protection techniques–Corrosion inhibitors, Corrosion resistant steels, Coatings to reinforcement, cathodic protection.

**UNIT V REPAIR, REHABILITATION AND RETROFITTING OF STRUCTURES 9**

Strengthening of Structural elements, Repair of structures distressed due to corrosion, fire, leakage, earthquake-Transportation of Structures from one place to other –Structural Health Monitoring-demolition techniques-Engineered demolition methods-Case studies

**TOTAL: 45 PERIODS**

**OUTCOMES:**

Students will be able to understand

- the importance of maintenance and assessment method of distressed structures.
- the strength and durability properties ,their effects due to climate and temperature.
- recent development in concrete
- the techniques for repair and protection methods
- repair, rehabilitation and retrofitting of structures and demolition methods.

**TEXT BOOKS:**

1. Shetty.M.S.ConcreteTechnology-Theory and Practice,S.Chandand Company, 2008.
2. Vidivelli.B Rehabilitation of Concrete Structures Standard Publishes Distribution.1<sup>st</sup> edition 2009.
3. Varghese.P.C Maintenance Repair and Rehabilitation & Minor works of building, Prentice Hall India Pvt Ltd 2014.
4. Dodge Woodson.R Concrete Structures, Protection, Repair and Rehabilitation, Butterworth-Heinemann,Elsevier,New Delhi 2012

**REFERENCES:**

1. DovKominetzky.M.S.,-Design and Construction Failures, Galgotia,Publications Pvt.Ltd.,2001
2. Ravishankar.K. Krishnamoorthy.T.S, Structural Health Monitoring, Repair And Rehabilitation of Concrete Structures, Allied Publishers, 2004.
3. Hand book onSeismic Retrofit of Buildings,CPWD and Indian Buildings Congress, Narosa Publishers, 2008.
4. 4.Hand Book on “Repair and Rehabilitation of RCC Buildings”–Director General works CPWD ,Govt of India , New Delhi–2002

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**OBJECTIVE:**

- To understand the behaviour of dynamic loading. Study the effect of earthquake loading on the behaviour of structures. Understand the codal provisions to design the structures as earthquake resistant.

**UNIT I SINGLE DEGREE OF FREEDOM SYSTEM 9**

Definition of degree of freedom – Idealization of structure as Single Degree of Freedom (SDOF) system – Formulation of equation of motion for various SDOF system – D’ Alemberts Principles – Effect of damping – Free and forced vibration of damped and undamped structures – Response to harmonic forces and periodic forces.

**UNIT II MULTI DEGREE OF FREEDOM SYSTEM 9**

Formulation of equation of motion for multidegree of freedom (MDOF) system – Evaluation of natural frequencies and modes – Eigen values and Eigen vectors – Response to free and forced vibration of undamped and damped MDOF systems – Modal superposition methods.

**UNIT III INTRODUCTION TO EARTHQUAKE ENGINEERING 9**

Elements of Engineering Seismology – Definitions, Introduction to Seismic hazard, Earthquake phenomenon – Seismotectonics – Seismic Instrumentation – Characteristics of Strong Earthquake motion – Estimation of Earthquake Parameters.

**UNIT IV EARTHQUAKE EFFECTS ON STRUCTURES 9**

Effect of earthquake on different types of structures – Behaviour of RCC, Steel and prestressed Concrete Structures under earthquake loading – Pinching Effect – Bouchinger Effects – Evaluation of Earthquake forces – IS Code 1893: 2002 – Response Spectra – Lessons learnt from past earthquakes.

**UNIT V CONCEPTS OF EARTHQUAKE RESISTANT DESIGN 9**

Causes of damage – Planning considerations/Architectural concept (IS 4326–1993) – Guidelines for Earthquake resistant design – Earthquake resistant design of masonry buildings – Design consideration – Guidelines – Earthquake resistant design of R.C.C. buildings – Lateral load analysis – Design and detailing (IS 13920:1993).

**TOTAL: 45 PERIODS****OUTCOMES:**

- Student will develop knowledge in the simulation and mathematical model development.
- Students will be trained to identify, formulate and solve complicated problem.
- Students will be able to understand the role of natural calamity in the damage of structures.
- Students will be able to develop the skill to analyse data and to apply the same in the practical problems.
- Students will be able to apply the developed methodologies for the safe and stable design of structures.

**TEXTBOOKS:**

1. Mario Paz, Structural Dynamics – Theory and Computations, Fourth Edition, CBS publishers, 1997.
2. Agarwal.P and Shrikhande.M. Earthquake Resistant Design of Structures, Prentice Hall of India Pvt. Ltd. 2007.

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

**REFERENCES:**

1. Clough.R.W, and Penzien.J, Dynamics of Structures, Second Edition, McGraw Hill International Edition, 1995.
2. Jai Krishna, Chandrasekaran.A.R., and Brijesh Chandra, Elements of Earthquake Engineering, South Asia Publishers, 1994.
3. Minoru Wakabayashi, Design of Earthquake Resistant Buildings, Mc Graw – Hill Book Company, 1986
4. Humar.J.L, Dynamics of Structures, Prentice Hall Inc., 1990.
5. Anil K Chopra, Dynamics of structures – Theory and applications to Earthquake Engineering, Prentice Hall Inc., 2007.
6. Moorthy.C.V.R., Earthquake Tips, NICEE, IIT Kanpur,2002.
7. IS13920-1993 Ductile detailing of reinforced concrete structures subjected to seismic forces - Code of practice.
8. IS 1893 part 1 2002 Indian standard criteria for earthquake resistant design of structures.
9. IS 4326-1993 Earthquake Resistant Design and Construction of Buildings--Code of Practice (Second Revision)



**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:**

- The student will have good knowledge about design principles, layout of factory and stages of loading in precast construction.
- Acquire knowledge about panel systems, slabs, connections used in precast construction and they will be in a position to design the elements.
- 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 Betor Verlag, 2009.

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

**OBJECTIVE:**

- To make the student to know about various bridge structures, selection of appropriate bridge structures and its design for given site conditions.

**UNIT I INTRODUCTION 9**

History of bridges - Components of a bridge - Classification of road bridges - Selection of site and initial decision process - Survey and alignment; Geotechnical investigations and interpretations. River Bridge: Selection of Bridge site and planning - Collection of bridge design data - Hydrological calculation

Road Bridges - IRC codes - Standard Loading for Bridge Design - Influence lines for statically determinate and indeterminate structures - Transverse distribution of Live loads among deck longitudinal - Load combinations for different working state and limit state designs

Railway Bridges: Loadings for Railway Bridges; Railroad data. Pre-design considerations - Railroad vs. Highway bridges.

**UNIT II SUPERSTRUCTURES 9**

Bridge decks – Structural forms and behaviour – Choices of superstructure types – Behaviour and modeling of bridge decks – Simple beam model – Plate model – Grillage method – Finite Element method - Different types of superstructure (RCC and PSC); Longitudinal Analysis of Bridge.-Transverse Analysis of Bridge - Temperature Analysis - Distortional Analysis - Effects of Differential settlement of supports - Reinforced earth structures.

**UNIT III DESIGN OF STEEL BRIDGES 9**

Design of Truss Bridges – Design of Plate girder bridges.

**UNIT IV DESIGN OF RC AND PSC BRIDGES 9**

Design of slab bridges – T beam bridges – PSC bridges

**UNIT V SUBSTRUCTURE, BEARINGS AND EXPANSION JOINTS, PARAPETS AND RAILINGS 9**

Substructure - Pier; Abutment - Wing walls- Importance of Soil-Structure Interaction - Types of foundations - Open foundation- Pile foundation- Well foundation- Simply supported bridge-Continuous Bridge - Bearings and Expansion Joints - Different types of bridge bearings and expansion joints - Parapets and Railings for Highway Bridges

**TOTAL: 45 PERIODS****OUTCOMES:**

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

- Identify loads on bridges and selection of type of bridge for the site condition
- Analyze the super structure by various methods.
- Design the trussed bridge and plate girder bridges
- Design reinforced concrete slab and T beam bridges and prestressed concrete bridges
- Decide the appropriate sub structural systems , bearings and expansion joints for the bridges.

**TEXTBOOKS:**

1. Johnson Victor D., “Essentials of Bridge Engineering”, Oxford and IBH Publishing Co., New Delhi, 2009.
2. Jagadeesh. T.R. and Jayaram. M.A., "Design of Bridge Structures", Prentice Hall of India Pvt. Ltd, Learning Pvt. Ltd., 2013

**REFERENCES:**

1. Phatak D.R., “Bridge Engineering”, Satya Prakashan, New Delhi, 1990.
2. Ponnuswamy S., “Bridge Engineering”, Tata McGraw-Hill, New Delhi, 1996.
3. Rajagopalan. N. “Bridge Superstructure”, Alpha Science International, 2006

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



**PRIST**  
DEEMED TO BE  
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NAAC ACCREDITED  
THANJAVUR – 613 403 - TAMIL NADU

**SCHOOL OF ENGINEERING AND TECHNOLOGY**

**DEPARTMENT OF CIVIL ENGINEERING**

**PROGRAM HANDBOOK**

**M.TECH (STRUCTURAL ENGINEERING)**

**FULL TIME PROGRAMME**

**[REGULATION 2019]**

[for candidates admitted to M.Tech (Structural Engineering) program from  
June 2019 onwards]

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## SEMESTER DETAILS

### CREDITS DISTRIBUTION

S. No	SEMESTER	TOTAL CREDITS
1	SEMESTER I	27
2	SEMESTER II	29
3	SEMESTER III	29
4	SEMESTER IV	15
	Total	100

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

### SEMESTER – I

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19248S11E	Advanced Engineering Mathematics	3	1	0	4
2	19255H12	Quality Control & Assurance in Construction	3	0	0	3
3	19255H13	Theory of Plasticity and Elasticity	3	1	0	4
4	19255H14	Structural Dynamics	3	1	0	4
5	19255H15	Maintenance and Rehabilitation of Structures	3	1	0	4
6	19255E16(A-C)	Hard Core Elective I	3	1	0	4
7	19255CRS	Research Led Seminar	4	0	0	1
8	19255L18	Core Practical (Computer Programming Lab)	0	0	3	3
TOTAL						27

### SEMESTER – II

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255H21	Management Information System	3	0	0	3
2	19255H22	Finite Element Analysis	3	1	0	4
3	19255H23	Advanced Concrete Structural Design	3	1	0	4
4	19255E24(A-C)	Hard Core Elective –II	3	0	0	3
5	19255E25(A-C)	Hard Core Elective –III	3	1	0	4
6	19255CRM	Research Methodology	4	0	0	3
7	19255CBR	Participation in Bounded Research	1	0	0	2
8	19255L28	Core practical (Software Lab – Finite Element Analysis- ANSYS)	0	0	3	3
9	192TECWR	Technical writing / Seminars	0	0	3	3
TOTAL						29

### SEMESTER – III

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255H31	Advanced Steel Structures	3	1	0	4
2	19255E32(A-C)	Hard Core Elective IV	3	1	0	4
3	19255E33(A-C)	Hard Core Elective V	3	1	0	4
4	19255E34(A-C)	Hard Core Elective VI	3	1	0	4
5	19255CSR	Design Project / Socio Technical Project	4	0	0	4
6	19255P36		0	0	9	9
TOTAL						29

### SEMESTER – IV

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255P41	Project Work Phase-II	0	0	15	15
TOTAL						15

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**LIST OF ELECTIVES**  
**SEMESTER I**  
**Hard Core Elective-I**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E16A	Prestressed Concrete Design	3	1	0	4
2	19255E16B	High Rise Structures	3	1	0	4
3	19255E16C	Computer Aided Structural Design	3	1	0	4

**SEMESTER II**  
**Hard Core Elective - II**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E24 A	Failure Analysis of Structures	3	1	0	4
2	19255E24 B	Advanced Concrete Technology	3	0	0	3
3	19255E24 C	Steel, Concrete Composite Structures	3	1	0	4

**Hard Core Elective - III**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E25A	Optimization in Structural Design	3	1	0	4
2	19255E25B	Design of Industrial Structures	3	1	0	4
3	19255E25 C	Elements of Earthquake Engineering	3	1	0	4

**SEMESTER III**  
**Hard Core Elective-IV**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E32A	Experimental Stress Analysis	3	1	0	4
2	19255E32B	Soil Structure Interaction	3	1	0	4
3	19255E32C	Aseismic Design of Structures	3	1	0	4

**Hard Core Elective – V**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E33A	Prefabricated Structures	3	1	0	4
2	19255E33B	Disaster Resistant Structures	3	1	0	4
3	19255E33C	Nonlinear Analysis of Structures	3	1	0	4

**Hard Core Elective – VI**

S. No	Subject Code	Name of the Subject	L	T	P	C
1	19255E34A	Offshore Structures	3	1	0	4
2	19255E34B	Stability of Structures	3	1	0	4
3	19255E34C	Mechanics of Composite Materials	3	1	0	4

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## SEMESTER I

19248S11E

ADVANCED ENGINEERING MATHEMATICS

L T P C  
3 1 0 4

### AIM & OBJECTIVES:

The course aim to develop the skills of the students in the areas of boundary value problems and transform techniques. The course will also serve as a prerequisite for post Graduate and specialized studies and research.

Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.

Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of differences equations.

### UNIT I LAPLACE TRANSFORM 12

Laplace transform methods for one-dimensional wave equation – Displacement in a long string – longitudinal vibration of an elastic bar – Laplace equation – properties of harmonic functions.

### UNITII FOURIERTRANSFORM 12

Fourier transforms methods for one – dimensional heat conduction problems in infinite and semi infinite rod – Fourier transform methods for Laplace equation.

### UNITIII PROBABILITY & DISTRIBUTION 12

Probability – definition and introduction – random variable – probability density functions – study of standard distributions: Binomial, Poisson, normal exponential and Weibull distributions – Applications – Baye’s theorem.

### UNITIV TESTING OF HYPOTHESIS 12

Testing of Hypothesis – Parametric test – Small samples – Test related proportion, Means, Standard deviation – Test based on chi-square, Goodness of fit and test of independence.

### UNITV THEORY OF ESTIMATION 12

Principles of least squares – Multiple and partial correlation and regression – Estimation of parameters – Method of moments.

**TOTAL: 60 PERIODS**

### REFERENCE BOOKS:

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and Liberman
4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999.

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENUEURSHIP

Objective:

- To understand the elements of quality planning and the implication
- To become aware of objectives and advantage of quality assurance
- To be exposed to means of quality control
- To study the relationship between quality control and assurance

**UNIT-I****9**

Construction Organisation and Quality Planning: Types of organizations - Inspection, control and enforcement - Quality Management Systems and method - Responsibilities and authorities in quality assurance and quality control - Architects, engineers, contractors, and special consultants, Quality circle.

**UNIT-II****9**

Quality policy, Objectives and methods in Construction Industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance - Taguchi's concept of quality - Codes and Standards - Document - Contract and construction programming - Inspection procedures - Processes and products - Total QA I QC programme and cost implication.

**UNIT-III****9**

Quality Assurance: Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

**UNIT-IV****9**

Quality Control: Total Quality Control- Quality Control by statistical methods — Sampling by attributes and by variables - Selection of new materials - Influence of drawings, detailing, specification,

**UNIT-V****9**

standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing -Value engineering and value analysis.

**TOTAL: 45 PERIODS****Books for the References:**

1. O'Brian, James J. "Construction Inspection Handbook - Quality Assurance and Quality Control", Van Nostrand, New York, 1989.
2. Tenah, Kwaku A. and Guevara, Jose M., "Fundamentals of Construction Management and Organization", Reston Publishing Co., Inc., Virginia, 1985.
3. Oglesby, Clarkson H. "Productivity Improvement in Construction", McGraw-Hill, New Delhi, 1989.

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



**AIM and OBJECTIVES:**

Emphasis is placed on static problems with linear material and small deformation. Many basic 2-D problems (such as plane strain and plane stress) and 3-D problems.

**UNIT I ANALYSIS OF STRESS AND STRAIN 12**

Analysis of stress and strain, stress strain relationship. Generalized Hook's law. Plane stress and plane strain.

**UNIT II DEFORMATION 12**

Basic concepts of deformation of deformable bodies - Transformations of stresses and strains in Cartesian and polar co-ordinates - Equilibrium equations in two and three dimensions in Cartesian co-ordinates.

**UNIT III TORSION 12**

Torsion of non-circular section - methods of analysis - membrane analogy - torsion of thin rectangular section and hollow thin walled sections.

**UNIT IV THEORY OF ENERGY 12**

Energy methods – Energy principles and theorem.

**UNIT V INTRODUCTION TO PROBLEMS IN PLASTICITY 12**

Physical assumption - criteria of yielding, yield surface, Flow rule (plastic stress strain relationship). Elastic plastic problems of beams in bending - plastic torsion.

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Timoshenko, S. and Goodier T.N. "Theory of Elasticity", McGraw Hill Book Co., New York, II Edition 1988.
2. Chwo P.C. and Pagano, N.J. "Elasticity Tensor, Dyadic an Engineering applications", D.Van Nestrand Co., In Co., 1967.
3. Chenn, W.P. and Henry D.J. "Plasticity for Structural Engineers", Springer Verlag New York 1988.
4. Mendelson, A., (2002), Plasticity: Theory & Applications, Mac Millan & Co., NewYork.
5. Sadhu Singh, (2004), Theory of Plasticity, Dhanpat Rai sons Private Limited, New Delhi.

**AIM and OBJECTIVES:**

This course covers the methods for analyzing the stresses and deflections developed in any given type of structures when it is subjected to an arbitrary dynamic loading.

**UNIT I PRINCIPLES OF DYNAMICS 12**

Formulation of equations of motion by different methods, single degree freedom systems, free and forced response, effect of damping.

**UNIT II MULTIDEGREE OF FREEDOM SYSTEMS 12**

Formulation of structure property matrices, Eigen values problems, Modes shapes and ortho normality of modes, Approximate methods of extraction of eigen values.

**UNIT III DYNAMIC RESPONSE OF MDOF SYSTEMS 12**

Mode superposition techniques, Numerical integration procedures.

**UNIT IV CONTINUOUS SYSTEMS 12**

Modeling - free and forced vibration of bars and beams.

**UNIT V APPLICATIONS 12**

Idealisation of structures to mathematical models, examples of wind, earthquake and impact

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Mario Paz, Structural Dynamics, CBS, Publishers, 1987.
2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 1981.
3. Clough and Penzien, (2000), Dynamics of Structures, Second Edition, McGraw Hill Book Company.

## 19255H15 MAINTENANCE & REHABILITATION OF STRUCTURES

L T P C

3 1 0 4

### AIM and OBJECTIVES:

Introduction to the governmental quality assurance regulations for public works. Application of quality control concepts, statistical experimental design principles to the construction process to minimize project costs and improve quality.

### UNIT I INTRODUCTION 12

Definitions: Maintenance, repair and rehabilitation, Facets of and importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration-testing techniques.

### UNIT II METEOROLOGICAL EFFECTS 12

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection

### UNIT III QUALITY CONTROL 12

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking.

### UNIT IV MATERIALS AND TECHNIQUES FOR REPAIR 12

Special concretes and mortar, concrete chemicals, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete. Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

### UNIT V DEMOLITION 12

Engineering demolition of structures – case studies

**TOTAL: 60 PERIODS**

### REFERENCE

1. Raikar, R.N., " Learning from failures - Deficiencies in Design ", Construction and Service , R & D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
2. Allen R.T., and Edwards S.C, *Repairs of Concrete Structures*, Blaike and Sons, U.K 1987.
3. Santhakumar, A.R., " Training Course notes on Damage Assessment and repair in Low Cost Housing ", " RHDC-NBO " Anna University, July, 1992.
4. N.Palaniappan, "Estate Management, Anna Institute of Management ", Chennai, 1992.
5. Lakshmipathy, Metal Lecture notes of Workshop on "Repairs & Rehabilitation of Structures ", 29 - 30th October 1999.

19255L17

**CORE PRACTICAL -I**

**COMPUTER PROGRAMMING LAB- AUTO CAD**

**AIM:**

To impart knowledge to analyze solve, design and Civil Engineering drawings using AutoCAD.

**OBJECTIVES:**

- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop civil engineering drawing using Auto CAD.

**UNIT I**

Introduction AutoCad – Definition of various commands used in AutoCAD

**UNIT II**

Simple Exercises using AutoCad commands – Produce drawing using AutoCad and output of all the drawings are taken print out in A4 sheet using Inkjet / Laser Printer or Plotter and produced in file form as regard.

**UNIT III**

Section of semicircular Arch, Section of a lean – to – roof and section of spread footing foundation

**UNIT IV**

Plan, section and elevation of a prayer hall, school building and residential building (R.C.C. Roof)

**UNIT V**

Preparation of approval drawing to be submitted to corporation or municipality showing required details in one such as site plan, ground floor plan, section and elevation, key plan, septic tank plan, rain water harvesting pit with all details and title block detail.

**TOTAL: 45 PERIODS**

**REFERENCES**

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & Drawing – Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing.
3. Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill.

## SEMESTER II

19255H21

MANAGEMENT INFORMATION SYSTEM

L T P C

3 0 0 3

Objective:

- To bring about an exposure to information systems in a formal manner
- To study the development of information systems
- To study the means of applying information systems models to project management
- To introduce system audit and to study its features

### UNIT-I 12

System Development: Information Systems - Establishing the Framework - Business Models - Evolution of Information Systems. Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.

### UNIT-II 12

Information Systems: Integrated Construction Management Information System - Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel .

### UNIT-III 12

Levels, DSS, EIS, ES - Comparison, Concepts and Knowledge Representation - Managing International Information System.

### UNIT-IV 12

Implementation and Control: Control - Testing Security - Coding Techniques - Defection of Error - Validating - Cost Engineering qualities - Design, Production, Service, Software specification.

### UNIT-V 12

Software Metrics, Software quality assurance - Systems Methodology - Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation.

**TOTAL: 45 PERIODS**

#### Books for the References:

1. Laudon, Kenneth C and Laudon, Jane Price. "Management Information Systems: Organisation and Technology", Prentice Hall of India, New Delhi, 1996.
2. Elam, Jo.yce J. "Case Series for Management Information Systems, Simon and Schuster", Custom Publishing, 1996.
3. Sprague, Ralph H and Watson, Huger J. "Decision Support for Managers", Prentice Hall, New Jersey, 1996

**AIM and OBJECTIVES:**

The finite element method is the most powerful structural analysis tool for the Civil Engineers. The basic formulation and programming technique are introduced. According to the same procedures, the different elements such as truss, beam, plate and shell are easily formulated.

**UNIT I INTRODUCTION: 12**  
Differential equilibrium equations - strain displacement relation - linear constitutive relation - special cases. Principle of stationary potential energy - application to finite element methods. Some numerical techniques in finite element Analysis

**UNIT II ANALYSIS OF PLATE BENDING; 12**  
Two Dimensional problems - Plane Stress, Plain Strain and Axisymmetric Problems - Triangular and beam element -. Analysis of plate bending - Basic theory of plate bending-displacement functions - plate bending Elements.

**UNIT III MODELS AND FUNCTION OF ELEMENT: 12**  
Displacement models - convergence requirements. Natural coordinate systems – Shape function. Interpolation function. Linear and quadratic elements - Lagrange & Serendipity elements.

**UNIT IV ANALYSIS OF NONLINEAR AND VIBRATION PROBLEMS: 12**  
Strain displacement matrix - Material and Geometric Nonlinearity - Methods of Treatment -Dynamic condensation-Eigen value extraction

**UNIT V ASSEMBLAGE OF ELEMENT: 12**  
Assemblage of elements – Direct stiffness method. Special characteristics of stiffness matrix - Boundary condition & reaction - Gauss elimination –Basic steps in Finite element analysis.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Krishnamoorthy, C.S, Finite Element Analysis Theory & Programming, McGraw- Hill
2. Desai C.S and Abel, J.F., Introduction to the finite element Method, AffiliatedEast west Press Pvt. Ltd. New Delhi 1997.
3. Bathe , K.J., Finite Elements Procedures in Engineering analysis, Prentice Hall Inc., 1995.

19255H23

ADVANCED CONCRETE STRUCTURAL DESIGN L T P C

3 1 0 4

**AIM and OBJECTIVES:**

To impart knowledge about the performance of concrete as structural material and the behavior, elastic and inelastic, of reinforced – concrete members and structures, designing structures safely, economically and efficiently.

**UNIT I INTRODUCTION 12**

The nature of concrete- Behaviour of concrete - stress-strain relationships of concrete, - stress-strain relationships of reinforcing steel- Failure criteria for concrete (crack width calculation is must).

**UNIT II REVIEW OF OVERALL DESIGN 12**

Limit state analysis and design of beams in flexure - Behavior of reinforced concrete members in bending - Plastic hinge – Rotation capacity – Factors affecting rotation capacity of a section – Plastic moment – Moment curvature relationship – Redistribution of moments.

**UNIT III STRUCTURAL DESIGN 12**

Limit state design of deep beams. Design of Flat Slabs using BIS 456. Design of slender columns subjected to combined bending moment and axial force using SP 16 .

**UNIT IV SHEAR WALL 12**

Analysis and design of shear wall framed buildings.

**UNIT V DUCTILITY 12**

Detailing for ductility - fire resistance of buildings - field control of concrete

**TOTAL: 60 PERIODS**

**REFERENCE**

- 1.Krishnaraju, (1998), Advanced Concrete Design, CBS Publishers and distributors, Delhi.
2. Varghese P.C, Design of Reinforced Concrete Structures, Prentice hall of India.
3. Krishnamurthy, K.T, Gharpure S.C. and A.B. Kulkarni – Limit design of reinforced concrete structures, Khanna Publishers, 1985.
- 4.Unnikrishna Pillai -TMH Books
- 5.Jain and Jaikrishna, (2002), Plain and reinforced concrete, Vol. II, Nemi Chand Bros., Roorkee.
- 6.Durham, (2003), Advanced Concrete Design, Oxford Publishing private Limited.

**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 9**

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 9**

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 9**

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 9**



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

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.

**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.

**AIM:**

To impart knowledge to analyze solve, design and Civil Engineering drawings using FEA - ANSYS

**OBJECTIVES:**

- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop Civil Engineering drawing using FEA – ANSYS

**LIST OF EXPERIMENTS**

1. Calculate the displacement and the member forces / reaction for the given simple truss with concentrated loads.
2. Calculate the displacement and the member forces / reaction for the given Stepped shaft subjected to temperature change.
3. Calculate the displacement and the member forces / reaction for the given beam with concentrated and distributed loads.
4. Find the natural frequencies and mode shapes of a given cantilever beam.
5. Find the maximum normal stress and stress concentration factor for the given plate with hole.

**REFERENCES:**

1. Fundamentals of Finite element analysis, David V. Hulton, Publisher- MC Graw – Hill Science.

## SEMESTER III

19255H31

ADVANCED STEEL STRUCTURES

L T P C

3 1 0 4

### AIM and OBJECTIVES:

Introduction to steel structure, tensioned member, compressed member, beam, design of beam and column, bolt jointing, welding jointing and other joint design.

#### **UNIT I COMPRESSION MEMBERS 12**

Design of compression members – Axially – Uni axial and biaxial bending.

#### **UNIT II PLASTIC ANALYSIS 12**

Plastic Analysis of Structures – Introduction - Shape factors – Mechanisms - Plastic hinge - Analysis of beams and portal frames - Design of continuous beams.

#### **UNIT III LIGHT WEIGHT STEEL STRUCTURES 12**

Design of Light Gauge Steel Structures - Types of cross sections - Local buckling and lateral buckling - Design of compression and tension members – Beams - Deflection of beams.

#### **UNIT IV LIMIT STATE DESIGN 12**

Limit state design of Steel Structures – Plastic section – Section classification – Partial safety factor.

#### **UNIT V DESIGN OF JOINTS AND CONNECTIONS 12**

Design of joints and connections – Riveted – Bolted – Welded – Semi rigid connection.

**TOTAL: 60 PERIODS**

### REFERENCE

1. Horne, M.R., and Morris, L.J., (1996), Plastic Design of Low-rise frames, Granada Publishing Ltd; N.Y.
2. Salmon, C.G., and Johnson, J.E., (2000), Steel Structures – Design and Behaviour, Harper and Row.
3. Kuzamanovic, B.O. and Williams, N., (1997), Steel Design for Structural Engineers, Prentice Hall.



19255E16B

**HIGH RISE STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIM and OBJECTIVES:**

This course covers the design criteria and loading pattern on high rise structures, behavior of structural systems and stability, design and analysis of tall buildings.

**UNIT I DESIGN CRITERIA 12**

Design philosophy, Loading, Sequential loading and materials - high performance Concrete - Fiber reinforced Concrete - Light weight Concrete - Design mixes.

**UNIT II LOADING AND MOVEMENT 12**

Gravity Loading: Dead and live load, methods of live load reduction, Impact, gravity loading, construction load. Wind loading: Static and dynamic approach, Analytical and wind tunnel experimental method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading working stress design, Limit state design, plastic design.

**UNIT III BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS 12**

Factors affecting growth, Height and Structural form. High rise behavior, Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, outrigger - braced and hybrid mega system.

**UNIT IV ANALYSIS AND DESIGN 12**

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of building as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerized general three dimensional analysis. Structural elements: Sectional shapes, properties and resisting capacity, design, deflection, cracking, pre stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance

**UNIT V STABILITY OF TALL BUILDINGS 12**

Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Dr. Y.P.Gupta, Editor. Proceedings National Seminar on High Rise Structures - Design and Construction practices for middle level cities Nov. 14 -16, 1995, New Age International Limited, Publishers, Madras - 20.
2. Wilf gang Schuller, High Rise Building Structures, John Wiley and Sons, 1977.
3. Bryan stafford Smith, Alexcoull, Tall Building Structures , Analysis and Design, John Wiley and Sons, Inc., 1991.
4. T.Y.Lin, D.Stotes Burry, Structural Concepts and system for Architects and Engineers. John Wiley, 1988.

**19255E16C**

**COMPUTER AIDED STRUCTURAL DESIGN**

**L T P C**

**3 1 0 4**

**AIM:**

To learn design and preparation of structural drawing of concrete and steel structures (STADD-PRO).

**OBJECTIVES:**

At the end of the course the students acquires hands on experiences in design and Preparation of structural drawing for concrete and steel structures normally encountered in Civil Engineering practice.

**UNIT I COMPUTER GRAPHICS**

**12**

Graphic primitives - Transformations - Basics of 2-D drafting - Modeling of curves and surfaces - Solid modeling Graphic standards - Drafting software packages and usage.

**UNIT II STRUCTURAL ANALYSIS**

**12**

Computer methods of structural analysis - Finite Element programming - Analysis through application packages.

**UNIT III STRUCTURAL DESIGN**

**12**

Computer aided design of steel and RC Structural elements - Detailed drawing - Bill of materials.

**UNIT IV OPTIMIZATION**

**12**

Linear programming - Simplex algorithm - Post-optimality analysis - Project scheduling - CPM and PERT applications Genetic algorithm and applications.

**UNIT V ARTIFICIAL INTELLIGENCE**

**12**

Introduction - Heuristic search - knowledge based expert systems - Architecture and applications of KBES - Expert system shells - Principles of neural network.

**TOTAL: 60 PERIODS**

**REFERENCES**

1. C..S.Krishnamoorthy and S.Rajeev, Computer Aided Design, Narosa PublishingHouse, New Delhi, 1991.
- 2.H.B.Harrison, Structural Analysis and Design Vol.I & II, Pergamon Press, 1991 E.Hinton and D.R.J.Owen, Finite Element Programming, Academic Press 1977.
- 3.Billy E.Gillet, Introduction to Operations Research, A computer orientedalgorithmic approach, Tata McGraw Hill 1982.
- 4.Richard Forsyth (Ed.), Expert System Principles and Case studies - Chapman & Hall.

## SEMESTER II

### HARD CORE ELECTIVES-II

**19255E24A**                      **FAILURE ANALYSIS OF STRUCTURES**                      **L T P C**  
**3 1 0 4**

#### **AIM and OBJECTIVES:**

This course introduces about the failure of structures, buckling failure of columns, deterioration of wood and miscellaneous failures.

#### **UNIT I INTRODUCTION** **12**

Causes of failure – Types of failure – durability of materials – various durability tests on materials.

#### **UNIT II STRUCTURAL FAILURE** **12**

Structural failure –material and load effects – environment effect - Non-structural and structural repairs

#### **UNIT III BUCKLING FAILURE ON COLUMNS** **12**

Buckling of columns with various end conditions - Elastically supported columns- non prismatic columns - Built-up columns - Inelastic buckling, Experimental study of column behavior, Empirical column formulae.

#### **UNIT IV DETERIORATION OF WOOD** **12**

Defects on wood – improper seasoning and defects – improving of surface of wood.

#### **UNIT V MISCELLANEOUS FAILURES** **12**

Pin-jointed And rigid jointed frames – concrete walls - arches – reinforced concrete beams and frames – repair of concrete bridge and water retaining structures.

**TOTAL: 60 PERIODS**

#### **REFERENCES**

- 1.Rasnom, W.H., Building Failures, E&F, N. SPON Ltd.
- 2.Moskvin V, Concrete and Reinforced Structures – Deterioration and Protection, Mir Publishers, Moscow, 1980.

**19255E24B**

**ADVANCED CONCRETE TECHNOLOGY**

**L T P C**  
**3 0 0 3**

**AIM and OBJECTVES:**

To learn the Performance of concrete as structural material and advanced technologies used in construction by using concrete.

**UNIT I INTRODUCTION TO CONCRETE 12**  
Materials - Concrete materials - Reinforcements and admixtures.

**UNIT II MIX DESIGN 12**  
Mix Design – Specifications - Design of concrete mixes by IS code method – ACI method - Road Note No:4 method – High strength concrete.

**UNIT III BEHAVIOUR OF CONCRETE 12**  
Behaviour of Concrete - Modern trends in concrete manufacture and placement techniques - Theological behaviour of fresh concrete and hardened concrete - Resistance to static and dynamic loads.

**UNIT IV TESTING 12**  
Testing of Concrete - Non-destructive testing and quality control – Durability - Corrosion protection and fire resistant.

**UNIT V SPECIAL CONCRETE 12**  
Special Concrete - Pre-cast concrete - Light weight concrete - Under water concrete -Pumped concrete - Polymer concrete - Composites and fibre reinforced concrete.

**TOTAL: 45 PERIODS**

**REFERENCES:**

- 1.Neville, A.M.(2003), Properties of Concrete, Standard Publishers Distributors.
- 2.Varshney(2000), Concrete Technology, Khanna Publishers, New Delhi.
- 3.IS : 383 – 1970, (2005), Specification for Coarse and fine natural sources for Concrete, BIS, New Delhi.
- 4.IS : 9103-1979, (2005), Specification for Admixtures for Concrete, BIS, New Delhi





### HARD CORE ELECTIVE III

**19255E25A**                      **OPTIMIZATION IN STRUCTURAL DESIGN**                      **L T P C**  
**3 1 0 4**

#### **AIM and OBJECTIVES:**

The structural analysis is formulated through the principle of optimization. Both the manual calculation and application of the computer are introduced for the analysis of truss and frame structures using optimization techniques.

**UNIT I INTRODUCTION** **12**  
Basic concepts of minimum weight, minimum cost design, Objective function, constraints and classical methods.

**UNIT II OPTIMIZATION TECHNIQUES** **12**  
Linear programming, Integer Programming, Quadratic Programming.

**UNIT III ALGORITHMS** **12**  
Dynamic Programming and Geometric Programming methods for Optimal design of structural elements.

**UNIT IV COMPUTER SEARCH METHODS** **12**  
Linear Programming methods for plastic design of frames, Computer search methods for univariate and multivariate Minimization.

**UNIT V OPTIMIZATION BY STRUCTURAL THEOREMS** **12**  
Maxwell, Mitchell and Heyman's Theorems for trusses and frames, fully stresses design with deflection constraints, optimality criterion methods.

**TOTAL: 60 PERIODS**

#### **REFERENCES**

1. Spunt, Optimum Structural Design, Civil Engineering and Engineering Mechanics Services, Prentice-Hall, New Jersey 1971.
2. S.S.Rao, Optimization Theory and Applications, Wiley Eastern Limited, New Delhi, 1977.
3. Uri Krisch, Optimum Structural Design, McGraw Hill Book Co. 1981.
4. Richard Bronson, Operation Research, Schaum's Outline Series, McGraw Hill Book Co, Singapore, 1983.

**AIM and OBJECTIVES:**

This course deals about the requirements, planning and construction techniques of an industry. And also deals with modes of communication and transport to be used in an industrial structures.

**UNIT I REQUIREMENTS OF AN INDUSTRY 12**

General - Specific requirements for industries like textile, sugar, cement, chemical, etc - Site layout and external facilities.

**UNIT II PLANNING 12**

Planning of Building Work – Standards - Structural materials including plastics – Polymers - Fibre glass - Pressed card boards, etc - Multi-storey buildings - Steel skeletal structures - Reinforced concrete frames – Workshops - Ware houses - Single storey buildings - Sheds in steel and reinforced concrete - North-lights - Single span spherical and other special constructions - Cooling towers and chimneys - Bunkers and silos' prefabrication - Construction.

**UNIT III CONSTRUCTION TECHNIQUES 12**

Construction Techniques - Expansion joints - Machine foundations - Other foundations - Water proofing - Roofs and roofing - Roof drainage - Floors and flooring joists - Curtain walling - Outer wall facing - Sound and shock proof mountings - Use of modern hoisting and other construction equipments.

**UNIT IV COMMUNICATION AND TRANSPORT 12**

Circulation - Communication and Transport - Fixed points ( central cores) – Staircases -Grid floor sections - Lifts refuse disposals - Utilization of waste materials – Cranes - Continuous conveyors - Mobile cranes – Transporters – Doors - Sliding gates.

**UNIT V FUNCTIONAL REQUIREMENTS 12**

Functional Requirements – Lighting: Natural lighting - Protection from the sun - skylights - window cleaning installations -Services: Layout – wiring – fixtures - cable and pipe bridges - electrical installations - lighting substation - Effluent. Ventilation and fire protection: Ventilation - Air-conditioning - Fire escapes and chutes - Fire alarms - Extinguishers and hydrants.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Water Henn, (1998), Buildings for industry, John Wiley and sons.
2. Glover, (1997), Structural Pre cast Concrete, Tata McGraw Hill.

19255E25C

ELEMENTS OF EARTHQUAKE ENGINEERING

L T P C

3 1 0 4

**AIM and OBJECTIVES:**

This course covers the theory and applications related to Earthquake Engineering. The broad subjects discussed in this course include earthquake response of linearly elastic and inelastic buildings, structural dynamics in building codes.

**UNIT I ELEMENTS AND FEATURES**

**12**

Elements of Seismology - Definitions of magnitude – Intensity - Epicentre etc - General features of tectonics of seismic regions - Seismographs.

**UNIT II THEORY OF VIBRATIONS**

**12**

Theory of Vibrations - Free vibrations of single degree - Two degree and multiple degree freedom systems - Computations of dynamic response to time dependent forces - Vibrations isolation – Vibration absorbers - Brief introduction to instruments - Accelerograms.

**UNIT III PRINCIPLES OF EARTHQUAKE DESIGN**

**12**

Principles of earthquake resistant design - Response spectrum theory - Application of response spectrum theory to seismic design of structures. Capacity - Design Principles - Design criteria for strength - Stiffness and ductility.

**UNIT IV EARTHQUAKE ANALYSIS**

**12**

Earthquake Analysis and Design - Characteristics of earthquake – Earthquake response of structures – Concept of earthquake resistance design – Code provisions for design of building – IS 1893 and IS 4326 – Energy absorption capacity.

**UNIT V COMPUTER APPLICATION**

**12**

Seismic analysis and design of a multi storied building using Computer.

**TOTAL: 60 PERIODS**

**REFERENCE**

- 1.Pauley & Priestly, (1992), Seismic design of reinforced concrete and masonry buildings, John Wiley & Sons.
- 2.Stratta.J.L, (1998), Manual of Seismic Design, Prentice-Hall India Pvt Ltd.
- 3.Kramer.S.L., (2002), Geotechnical Earthquake Engineering, Prentice-Hall India Pvt Ltd.

**SEMESTER III  
HARD CORE ELECTIVE IV**

**19255E32A**

**EXPERIMENTAL STRESS ANALYSIS**

**L T P C  
3 1 0 4**

**AIM and OBJECTIVES:**

At the end of the semester students can learn about the strain gauges, strain rosetters, model analysis, calibration of photo elastic materials.

**UNIT I STRAIN GAUGES 12**  
Strain Gauges - Mechanical and optical strain gauges – Description and operation – Electrical resistance- Inductance and capacitance gauges – Detailed treatment on resistant gauges – Measurement of static and dynamic strains – Strain rosettes – Effect of transverse strains – Use of strain recorders and load cells.

**UNIT II MODEL ANALYSIS 12**  
Model Analysis - Structural similitude – Use of models – Structural and dimensional analysis – Buckingham Pi Theorem – Muller Breslau's principle for indirect model analysis – Use of Begg's and Eney's deformeters – Moment indicators – Design of models for direct and indirect analysis.

**UNIT III CALIBRATION 12**  
Two dimensional photo elasticity - Stress optic law – Introduction to polariscope – Plane and circular polariscope – Compensators and model materials – Material and model fringe value – Calibration of photo elastic materials – Isochromatic and isoclinic fringes – Time edge effects.

**UNIT IV PHOTO ELASTICITY 12**  
Three dimensional photo elasticity - Introduction – Stress freezing techniques – Stress separation techniques – Scattered light photo elasticity – Reflection polariscope.

**UNIT V MISCELLANEOUS METHODS 12**  
Brittle coating method – Birefringence techniques – Moire fringe method – Non-destructive testing – Ultrasonic pulse velocity technique – Rebound hammer method – X-ray method – Gamma-ray method.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Dally J.W., Riley W.F., Experimental Stress Analysis, McGraw Hill Book Company, New York.
2. Heteny M; Handbook of Experimental Stress Analysis, John Wiley and Sons, New York.
3. Frocht M.M.; Photoelasticity Vol. I & II. John Wiley and Sons, New York.

19255E32B

**SOIL STRUCTURE INTERACTION**

**L T P C**

**3 1 0 4**

**AIM & OBJECTIVES:**

This course deals with the soil- foundation interaction, analysis of beams and finite plates, elastic analysis of pile, load deflection for laterally loaded pile.

**UNIT I SOIL-FOUNDATION INTERACTION 12**

Introduction to soil-Foundation interaction problems, soil behaviour, Foundation behavior, Interface behavior, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic models, Elastic plastic behavior, Time dependent behavior

**UNIT II BEAM ON ELASTIC FOUNDATION- SOIL MODELS 12**

Infinite beam, two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness

**UNIT III PLATE ON ELASTIC MEDIUM 12**

Infinite plate, Winkler, Two parameters, isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions

**UNIT IV ELASTIC ANALYSIS OF PILE 12**

Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

**UNIT V LATERALLY LOADED PILE 12**

Load deflection prediction for laterally loaded piles, Sub grade reaction and elastic analysis, Interaction analysis, Pile raft system, Solutions through influence charts

**TOTAL: 60 PERIODS**

**References:**

1. Selva durai, A.P.S., Elastic Analysis of Soil Foundation Interaction, Elsevier,1979
2. Poulos, H.G., and Davis,E.H., Pile Foundation Analysis and Design, John Wiley,1980
3. Scott,R.F.,Foundation Analysis,Prentice Hall,1981
4. Structure Soil Interaction - State of Art Report,Institution of Structural Engineers,1978.
5. ACI 336, Suggested Analysis and Design Procedures for combined footings and Mats, American Concrete Institute, Delhi, 1988

19255E32C

**ASEISMIC DESIGN OF STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIMS &OBJECTIVES:**

This course deals about seismology, seismic design concepts, codal provisions and detailing of frames.

**UNIT I INTRODUCTION** **12**  
Elements of Engineering Seismology - Theory of Vibration - Response Spectrum.

**UNIT II HISTORICAL** **12**  
Indian Seismicity - Earthquake History - Behaviour of Structures in the past Earthquakes.

**UNIT III DESIGN CONCEPTS** **12**  
Seismic Design Concepts - Cyclic load behaviour of RC, Steel and Prestressed Concrete elements – Design spectrum - Principles of capacity design.

**UNIT IV CODAL PROVISIONS** **12**  
Provisions of Seismic Code (IS 1893) - Building systems frames, shear walls, Braced Frames, Combinations - Torsion.

**UNIT V DESIGN AND DETAILING** **12**  
Performance of Regular Buildings 3 D Computer Analysis of Building Systems (Theory Only) - Design and Detailing of frames - Shear walls and Frame walls.

**TOTAL: 60 PERIODS**

**References:**

1. Course Notes "Design of Reinforced Concrete Building", IIT, Kanpur, June 1999.
2. Bungale S.Taranath "Structural Analysis and Design of Tall Buildings" McGraw Hill Book Company, New York, 1999.

19255E33A

**HARD CORE ELECTIVE V  
PREFABRICATED STRUCTURES**

**L T P C  
3 1 0 4**

**AIMS & OBJECTIVES:**

This course explains about design principles of Prefabricated Structures, components, application of prefabricated structures. Students can learn the usage of prefabricated structures in wall panels, industrial buildings and shell roofs.

**UNIT I DESIGN PRINCIPLES 12**

General Civil Engineering requirements- IS Code specifications. Modular co-ordination, standardization- Disuniting of Prefabricates, production, transportation, and erection-Safety factors, material properties, Deflection control.

**UNIT II REINFORCED CONCRETE 12**

Prefabricated structures - Long wall and cross-wall large panel buildings- One way and two way prefabricated slabs- Framed buildings with partial and curtain walls- Connections – Beam to column and column to column

**UNIT III FLOORS, STAIRS AND ROOFS 12**

Types of floor slabs, analysis and design example of cored and panel - Staircase slab design, types of roof slabs and insulation requirements- Description of joints, their behavior and reinforcement requirements- Ultimate strength calculations in shear and flexure

**UNIT IV WALL 12**

Types of wall panels, Blocks and large panels, Curtain- Partition and load bearing walls, load transfer from floor to wall panels- Design Curves, types of wall joints, their Behaviour and design -Leak prevention, joint sealants, sandwich wall panels

**UNIT V INDUSTRIAL BUILDINGS AND SHELL ROOFS 12**

Components of single-storey industrial sheds with crane gantry systems- R.C. Roof Trusses, Roof Panels, corbels and columns- Cylindrical, Folded plate and hyper-prefabricated shells- Erection and jointing, joint design, hand book based design

**TOTAL: 60 PERIODS**

**REFERENCE BOOKS**

1. Murashev.V., Sigalov.E., and Bailov.V., Design of Reinforced Concrete Structures, Mir Publishers
2. Gerostiza. C.Z., Hendrikson, C. and Rehat D.R., Knowledge Based Process Planning for Construction and Manufacturing, Academic Press, Inc
3. Hass, A.M. Precast Concrete Design and Applications, Applied Science Publishers, 1983.



19255E33B

**DISASTER RESISTANT STRUCTURES**

**L T P C**

**3 1 0 4**

**AIMS & OBJECTIVES:**

This course deals the philosophy of the design of disaster resistant structures such as dams , bridges and emphasize about the rehabilitation , retrofitting and damage assessment of structures.

**UNIT I BEHAVIOUR OF LIFE-LINE STRUCTURES 12**

Philosophy for design to resist earthquake, cyclone and flood - National and International codes of practice - By-Law of urban and semi-urban areas - Traditional and modern structures.

**UNIT II COMMUNITY STRUCTURES 12**

Response of dams, bridges, buildings - Strengthening measures - Safety analysis and rating – Reliability assessment.

**UNIT III REHABILITATION AND RETROFITTING 12**

Testing and evaluation - Classification of structures for safety point of view - methods of strengthening for different disasters - qualification test.

**UNIT IV DETAILING OF STRUCTURES AND COMPONENTS 12**

Use of modern materials and their impact on disaster reduction - Use of modern analysis, design and construction techniques optimization for performance.

**UNIT V DAMAGE ASSESSMENT OF STRUCTURES 12**

Damage surveys - Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety - Ground improvement techniques.

**TOTAL: 60 PERIODS**

**TEXT BOOKS:**

1. V.Moskvin , et.al Concrete and Reinforced Concrete - Deterioration and Protection - Mir Publishers - Moscow 1980.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, U.K 1987.

**REFERENCES:**

1. Proceedings IABSE 14th Congress "Civilization through Civil Engineering" New Delhi May 1992.
2. Raiker R.N.Learning from failures Deficiencies in Design, Construction and Service , R & D Center (SDCPL) Raiker Bhavan, Bombay, 1987.

19255E33C

NONLINEAR ANALYSIS OF STRUCTURES

L T P C

3 1 0 4

**AIMS & OBJECTIVES:**

This course deals about the non-linearities, non-linear equations and non linear static analysis of plates, columns, trusses and frames.

**UNIT I TYPES OF NONLINEARITIES 12**

Geometric Nonlinearity, Material Nonlinearity, Nonlinear Governing Equation for Beams: Moment-curvature Nonlinearity, Geometric Nonlinearity Due to Stretching, Material Nonlinearity, Geometrically Nonlinear Beam Problems - Moment-Curvature Nonlinearity- Cantilever Beam, Centrally Loaded beam with two supports, Cantilever Beam subjected to TipLoad

**UNIT II NONLINEAR EQUATIONS OF PLATES 12**

Nonlinear Static Analysis of Plates - Geometric and Material Nonlinearities, Governing Stress Function Approach, Displacement Equations Approach.

**UNIT III NONLINEAR STATIC ANALYSIS OF PLATES 12**

Boundary Conditions and method of solution, Large Deflection of Rectangular Plates.

**UNIT IV NONLINEAR ANALYSIS OF COLUMNS 12**

Post buckling of cantilever column, large deflection of column with both ends hinged

**UNIT V NONLINEAR ANALYSIS OF TRUSSES AND FRAMES 12**

Nonlinear Analysis of Trusses and Nonlinear Elastic Analysis of Frames - Derivation of non linear stiffness matrix, Matrix displacement method for nonlinear analysis of structures, nonlinear analysis of plane frames.

**TOTAL: 60 PERIODS**

**REFERENCE:**

1. M.Sathyamoorthy, 'Nonlinear Analysis of Structures', CRC Press, New York
2. K.I. Majid, 'Non Linear Structures', Butter worth Publishers, London.
3. N G R Iyengar, 'Elastic Stability of Structural elements', Macmillan India Ltd

## HARD CORE ELECTIVE VI

19255E34A

OFFSHORE STRUCTURES

L T P C

3 1 0 4

### AIMS & OBJECTIVES:

This course includes the details of wave theories, forces in offshore structures and design and analysis of offshore structures .

#### UNIT I WAVE THEORIES 12

Wave generation process, small and finite amplitude wave theories.

#### UNIT II FORCES OF OFFSHORE STRUCTURES 12

Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

#### UNIT III OFFSHORE SOIL AND STRUCTURE MODELING 12

Different types of offshore structures, foundation modeling, and structural modeling.

#### UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 12

Static method of analysis, foundation analysis and dynamics of offshore structures.

#### UNIT V DESIGN OF OFFSHORE STRUCTURES 12

Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

**TOTAL: 60 PERIODS**

### References:

1. Chakrabarti, S.K. Hydrodynamics of Offshore Structures, Computational Mechanics Publications, 1987.
2. Thomas H. Dawson, Offshore Structural Engineering, Prentice Hall Inc Englewood Cliffs, N.J. 1983
3. API, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms, American Petroleum Institute Publication, RP2A, Dalls, Tex.
4. Wiegel, R.L., Oceanographical Engineering, Prentice Hall Inc, Englewood Cliffs, N.J. 1964.
5. Brebia, C.A.Walker, S., Dynamic Analysis of Offshore Structures, New-nes Butterworth's, U.K. 1979.
6. Reddy, D.V. and Arockiasamy, M., Offshore Structures, Vol.1, Krieger Publishing Company, Malabar, Florida, 1991.

19255E34B

**STABILITY OF STRUCTURES**

**L T P C**

**3 1 0 4**

**AIMS & OBJECTIVES:**

This course deals with the concept and characteristics of stability problems and behavior of torsional buckling and lateral buckling in beams and columns.

**UNIT I INTRODUCTION 12**

Concept of stability approaches to stability analysis, characteristics of stability problems.

**UNIT II COLUMNS 12**

Buckling of columns with various end conditions, imperfect columns, elastically supported columns, non prismatic columns, Built-up columns, Inelastic buckling, Experimental study of column behavior, Empirical column formulae. Buckling of bars on elastic foundations, large deflection of buckled bars.

**UNIT III BEAMS – COLUMNS 12**

Beam-column theory, Application to buckling of frames.

**UNIT IV TORSIONAL BUCKLING 12**

Combined torsional and flexural buckling.

**UNIT V LATERAL BUCKLING 12**

Lateral buckling of beams, pure bending of simply supported beam and cantilever, numerical solutions.

**TOTAL: 60 PERIODS**

**REFERENCES BOOKS:**

1. Allen, H.G., and Bulson, P.S., Background to Buckling, McGraw Hill Book Company, 1980.
2. Smits, Elastic Stability of Structures, Prentice Hall, 1973.
3. Timoshenko, S., and Gere., Theory of Elastic Stability, McGraw Hill Book Company, 1961.
4. Brush and Almoth., Buckling of Bars, Plates and Shells, McGraw Hill Book Company, 1975.
5. Chajes, A. Principles of Structures Stability Theory, Prentice Hall, 1974.
6. Ashwini Kumar, Stability Theory of Structures, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.

**AIMS & OBJECTIVES:**

This course introduces the properties of materials, strength and elastic behavior of composite lamina and design of composite structures.

**UNIT I INTRODUCTION TO MODERN MATERIALS 12**

Fiber-Reinforced Polymer Composite (FRPC) Materials: Definition, Historical development, applications. Fibers and Matrix, types and their properties. Manufacturing process and methods for composites. Types and classification of composite materials, properties, advantages over conventional materials. Piezoelectric Materials: History, crystal structure, applications. Shape Memory Alloys (SMA), Functionally Graded Materials (FGM): definition and applications.

**UNIT II ENGINEERING PROPERTIES OF MODERN MATERIALS 12**

FRPC Composite Lamina: Micromechanics approach, methods. Longitudinal and transverse elastic properties of composite lamina, in-plane shear modulus for continuous fibers. Stress-strain relationship, compliance and stiffness matrices for generally anisotropic, specially orthotropic material, transversely isotropic material, orthotropic, isotropic materials, Plane stress condition for thin lamina, transformation of stress and elastic properties. Three dimensional transformations. Piezoelectric Materials: Piezoelectric coefficients, electric displacements, piezoelectric strain matrix for Quartz, Lead Zirconate-titanate, Polyvinylidene fluoride. Stiffness matrix for Functionally Graded Materials.

**UNIT III STRENGTH OF COMPOSITE LAMINA 12**

Introduction. Failure theories, Maximum stress theory, Maximum strain theory, Energy based interaction theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu), Failure mode based theory (Hasin-Rotem). Computation of lamina strength by Tsai-Wu theory for plane stress condition. Comparison of various failure theories.

**UNIT IV ELASTIC BEHAVIOUR OF COMPOSITE LAMINATES 12**

Basic assumptions, Laminate configurations, Strain displacement relationship, Stress-strain relationship, Force and moment resultants, Laminate compliances and stiffness matrices, Transformation of matrices. Load deformation relationship for symmetric laminates, symmetric cross-ply, symmetric angle-ply, balanced, antisymmetric cross-ply and angle ply, orthotropic, quasi-isotropic laminates.

**UNIT V HYGROTHERMAL EXPANSION AND DESIGN OF COMPOSITE STRUCTURE 12**

Coefficients of thermal and moisture expansion of various unidirectional lamina, load deformation relationship, residual stresses for cross ply symmetric laminates. Design methodology, design of pressure vessel for various laminate configurations.

**REFERENCEBOOKS:**

1. Isaac M. Daniel and Ori Ishai - Engineering Mechanics of Composite Materials, Oxford University Press, Second Edition, New Delhi.
2. Michael W. Hyer - Stress Analysis of Fiber-Reinforced Composite Materials, WCB/McGraw-Hill, Singapore.
3. Jones R. M. – Mechanics of Composite Materials, McGraw-Hill, New York
4. Roman Solecki and R Jay Conant – Advanced Mechanics of Materials, Oxford University Press, New York, Special Edition for sale in India.



**PRIST UNIVERSITY**  
VALLAM, THANJAVUR.

DEPARTMENT OF CIVIL ENGINEERING  
**PROGRAM HANDBOOK**

**M.TECH (STRUCTURAL ENGINEERING)**  
**PaRT TIME PROGRaMME**

[REGULATION 2019]

[for candidates admitted to M.Tech (Structural Engineering-Part Time) program from  
June 2019 onwards]

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

### CREDITS DISTRIBUTION

S. No	SEMESTER	TOTAL CREDITS
1	SEMESTER I	16
2	SEMESTER II	23
3	SEMESTER III	12
4	SEMESTER IV	22
5	SEMESTER V	12
6	SEMESTER VI	12
	Total	97

### SEMESTER – I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19248S11EP	Advanced Engineering Mathematics	3	1	0	4
2	19255C12P	Quality Control & Assurance in Construction	3	1	0	4
3	19255C13P	Theory of Plasticity and Elasticity	3	1	0	4
4	19255L14P	Computer Programming Lab	0	0	3	3
5	19255CRSP	Research Led Seminar	4	0	0	1
TOTAL						16

### SEMESTER – II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255C21P	Management Information System	3	1	0	4
2	19255C22P	Finite Element Analysis	3	1	0	4
3	19255E23-P	Elective I-(ACT)	3	1	0	4
4	19255L24P	Software Lab – ANSYS	0	0	3	3
5	192TECW RP	Technical Writing / Seminars	0	0	3	3
6	19255CRMP	Research Methodology	4	0	0	3
7	19255CBRP	Participation in Bounded Research	1	0	0	2
TOTAL						23

### SEMESTER – III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255C31P	Structural Dynamics	3	1	0	4
2	19255C32P	Maintenance and Rehabilitation of Structures	3	1	0	4
3	19255E33-P	Elective II	3	1	0	4
TOTAL						16

### SEMESTER – IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255C41P	Advanced Concrete Structural design	3	1	0	4
2	19255C42P	Advanced Steel Structures	3	1	0	4
3	19255E43-P	Elective III	3	1	0	4
4	19255P44P	Project Work Phase I	0	0	6	6
5	19255CSR P	Design / Socio -Technical Project	4	0	0	4
Total Credits						18



**SEMESTER – V**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E51-P	Elective IV	3	1	0	4
2	19255E52-P	Elective V	3	1	0	4
3	19255E53-P	Elective VI	3	1	0	4
TOTAL						12

**SEMESTER – VI**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255P61P	Project Work Phase II	0	0	12	12
Total Credits						12

**LIST OF ELECTIVES**  
**SEMESTER II**  
**Elective-I**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E23AP	Failure Analysis of Structures	3	1	0	4
2	19255E23BP	Advanced Concrete Technology	3	1	0	4
3	19255E23CP	Steel, Concrete Composite Structures	3	1	0	4

**SEMESTER III**  
**Elective - II**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E33AP	Prestressed Concrete Design	3	1	0	4
2	19255E33BP	High Rise Structures	3	1	0	4
3	19255E33CP	Computer Aided Structural Design	3	1	0	4

**SEMESTER IV**  
**Elective - III**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E43AP	Optimization In Structural Design	3	1	0	4
2	19255E43BP	Design Of Industrial Structures	3	1	0	4
3	19255E43CP	Elements Of Earthquake Engineering	3	1	0	4

**SEMESTER V**  
**Elective-IV**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E51AP	Experimental Stress Analysis	3	1	0	4
2	19255E51BP	Soil Structure Interaction	3	1	0	4
3	19255E51CP	A seismic Design Of Structures	3	1	0	4

**Elective – V**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E52AP	Prefabricated Structures	3	1	0	4
2	19255E52BP	Disaster Resistant Structures	3	1	0	4
3	19255E52CP	Nonlinear Analysis of Structures	3	1	0	4

**Elective - VI**

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	19255E53AP	Offshore Structures	3	1	0	4
2	19255E53BP	Stability Of Structures	3	1	0	4
3	19255E53CP	Mechanics Of Composite Materials	3	1	0	4

**AIM & OBJECTIVES:**

The course aim to develop the skills of the students in the areas of boundary value problems and transform techniques. The course will also serve as a prerequisite for post Graduate and specialized studies and research.

Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.

Have learnt the basics of Z – transform in its applicability to discretely varying functions, gained the skill to formulate certain problems in terms of differences equations.

**UNIT I LAPLACE TRANSFORM 12**

Laplace transform methods for one-dimensional wave equation – Displacement in a long string – longitudinal vibration of an elastic bar – Laplace equation – properties of harmonic functions.

**UNIT II FOURIER TRANSFORM 12**

Fourier transforms methods for one – dimensional heat conduction problems in infinite and semi infinite rod – Fourier transform methods for Laplace equation.

**UNIT III PROBABILITY & DISTRIBUTION 12**

Probability – definition and introduction – random variable – probability density functions – study of standard distributions: Binomial, Poisson, normal exponential and Weibull distributions – Applications – Baye’s theorem.

**UNIT IV TESTING OF HYPOTHESIS 12**

Testing of Hypothesis – Parametric test – Small samples – Test related proportion, Means, Standard deviation – Test based on chi-square, Goodness of fit and test of independence.

**UNIT V THEORY OF ESTIMATION 12**

Principles of least squares – Multiple and partial correlation and regression – Estimation of parameters – Method of moments.

**TOTAL: 60 PERIODS**

**REFERENCE BOOKS:**

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and Liberman
4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999.

**19255C12P QUALITY CONTROL AND ASSURANCE IN CONSTRUCTION L T P C**  
**3 1 0 4**

**OBJECTIVE:**

- To understand the elements of quality planning and the implication
- To become aware of objectives and advantage of quality assurance
- To be exposed to means of quality control
- To study the relationship between quality control and assurance

**UNIT-I** **12**  
Construction Organisation and Quality Planning: Types of organizations - Inspection, control and enforcement - Quality Management Systems and method - Responsibilities and authorities in quality assurance and quality control - Architects, engineers, contractors, and special consultants, Quality circle.

**UNIT-II** **12**  
Quality policy, Objectives and methods in Construction Industry - Consumers satisfaction, Ergonomics - Time of Completion - Statistical tolerance - Taguchi's concept of quality - Codes and Standards - Document - Contract and construction programming - Inspection procedures - Processes and products - Total QA I QC programme and cost implication.

**UNIT-III** **12**  
Quality Assurance: Objectives - Regularity agent, owner, design, contract and construction oriented objectives, methods - Techniques and needs of QA/QC - Different aspects of quality - Appraisals, Factors influencing construction quality - Critical, major failure aspects and failure mode analysis, -Stability methods and tools, optimum design - Reliability testing, reliability coefficient and reliability prediction.

**UNIT-IV** **12**  
Quality Control: Total Quality Control- Quality Control by statistical methods — Sampling by attributes and by variables - Selection of new materials - Influence of drawings, detailing, specification,

**UNIT-V** **12**  
Standardization - Bid preparation - Construction activity, environmental safety, social and environmental factors - Natural causes and speed of construction - Life cycle costing -Value engineering and value analysis.

**TOTAL: 45 PERIODS**

**Books for the References:**

1. O'Brian, James J. "Construction Inspection Handbook - Quality Assurance and Quality Control", Van Nostrand, New York, 1989.
2. Tenah, Kwaku A. and Guevara, Jose M., "Fundamentals of Construction Management and Organization", Reston Publishing Co., Inc., Virginia, 1985.
3. Oglesby, Clarkson H. "Productivity Improvement in Construction", McGraw-Hill, New Delhi, 1989.

19255C13P

**THEORY OF PLASTICITY AND ELASTICITY**

**L T P C**  
**3 1 0 4**

**AIM & OBJECTIVES:**

Emphasis is placed on static problems with linear material and small deformation. Many basic 2-D problems (such as plane strain and plane stress) and 3-D problems.

**UNIT I ANALYSIS OF STRESS AND STRAIN 12**

Analysis of stress and strain, stress strain relationship. Generalized Hook's law. Plane stress and plane strain.

**UNIT II DEFORMATION 12**

Basic concepts of deformation of deformable bodies - Transformations of stresses and strains in Cartesian and polar co-ordinates - Equilibrium equations in two and three dimensions in Cartesian co-ordinates.

**UNIT III TORSION 12**

Torsion of non-circular section - methods of analysis - membrane analogy - torsion of thin rectangular section and hollow thin walled sections.

**UNIT IV THEORY OF ENERGY 12**

Energy methods – Energy principles and theorem.

**UNIT V INTRODUCTION TO PROBLEMS IN PLASTICITY 12**

Physical assumption - criteria of yielding, yield surface, Flow rule (plastic stress strain relationship). Elastic plastic problems of beams in bending - plastic torsion.

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Timoshenko, S. and Goodier T.N. "Theory of Elasticity", McGraw Hill Book Co., New York, II Edition 1988.
2. Chwo P.C. and Pagano, N.J. "Elasticity Tensor, Dyadic and Engineering applications", D. Van Nostrand Co., In Co., 1967.
3. Chenn, W.P. and Henry D.J. "Plasticity for Structural Engineers", Springer Verlag New York 1988.
4. Mendelson, A., (2002), Plasticity: Theory & Applications, Mac Millan & Co., New York.
5. Sadhu Singh, (2004), Theory of Plasticity, Dhanpat Rai sons Private Limited, New Delhi.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

19255L14P

**CORE PRACTICAL -I**  
**COMPUTER PROGRAMMING LAB- AUTO CAD**

**L T P C**  
**0 0 3 3**

**AIM:**

To impart knowledge to analyze solve, design and Civil Engineering drawings using AutoCAD.

**OBJECTIVES:**

- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop civil engineering drawing using Auto CAD.

**UNIT I**

Introduction AutoCad – Definition of various commands used in AutoCAD

**UNIT II**

Simple Exercises using AutoCad commands – Produce drawing using AutoCad and output of all the drawings are taken print out in A4 sheet using Inkjet / Laser Printer or Plotter and produced in file form as regard.

**UNIT III**

Section of semicircular Arch, Section of a lean – to – roof and section of spread footing foundation

**UNIT IV**

Plan, section and elevation of a prayer hall, school building and residential building (R.C.C. Roof)

**UNIT V**

Preparation of approval drawing to be submitted to corporation or municipality showing required details in one such as site plan, ground floor plan, section and elevation, key plan, septic tank plan, rain water harvesting pit with all details and title block detail.

**TOTAL: 45 PERIODS**

**REFERENCES**

1. Building drawing – Shah, Tata McGraw-Hill
2. Building planning & Drawing – Dr. N. Kumaraswamy, A. Kameswara Rao, Charotar Publishing.
3. Shah, Kale and Patki, Building Drawing, Tata McGraw-Hill.

## SEMESTER II

19255C21P

MANAGEMENT INFORMATION SYSTEM

L T P C

3 1 0 4

Objective:

- To bring about an exposure to information systems in a formal manner
- To study the development of information systems
- To study the means of applying information systems models to project management
- To introduce system audit and to study its features

### UNIT-I

12

System Development: Information Systems - Establishing the Framework - Business Models - Evolution of Information Systems. Modern Information System - System Development Life Cycle - Structured Methodologies - Designing Computer Based Methods, Procedures, Control - Designing Structured Programs.

### UNIT-II

12

Information Systems: Integrated Construction Management Information System – Project Management Information System - Functional Areas, Finance, Marketing, Production, Personnel .

### UNIT-III

12

Levels, DSS, EIS, ES - Comparison, Concepts and Knowledge Representation –Managing International Information System.

### UNIT-IV

12

Implementation and Control: Control - Testing Security - Coding Techniques - Defection of Error -Validating - Cost Engineering qualities - Design, Production, Service, Software specification.

### UNIT-V

12

Software Metrics, Software quality assurance - Systems Methodology - Objectives - Time and Logic, Knowledge and Human Dimension - Software life cycle models - Verification and Validation.

**TOTAL: 60 PERIODS**

### Books for the References:

1. Laudon, Kenneth C and Laudon, Jane Price. “Management Information Systems: Organisation and Technology”, Prentice Hall of India, New Delhi, 1996.
2. Elam, Jo.yce J. “Case Series for Management Information Systems, Simon and Schuster”, Custom Publishing, 1996.
3. Sprague, Ralph H and Watson, Hugu J. “Decision Support for Managers”, Prentice Hall,NewJersey,1996

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

19255C22P

FINITE ELEMENT ANALYSIS

L T P C

3 1 0 4

**AIM & OBJECTIVES:**

The finite element method is the most powerful structural analysis tool for the Civil Engineers. The basic formulation and programming technique are introduced. According to the same procedures, the different elements such as truss, beam, plate and shell are easily formulated.

**UNIT I INTRODUCTION: 12**  
Differential equilibrium equations - strain displacement relation - linear constitutive relation - special cases. Principle of stationary potential energy - application to finite element methods. Some numerical techniques in finite element Analysis

**UNIT II ANALYSIS OF PLATE BENDING; 12**  
Two Dimensional problems - Plane Stress, Plain Strain and Axisymmetric Problems - Triangular and beam element -. Analysis of plate bending - Basic theory of plate bending-displacement functions - plate bending Elements.

**UNIT III MODELS AND FUNCTION OF ELEMENT: 12**  
Displacement models - convergence requirements. Natural coordinate systems – Shape function. Interpolation function. Linear and quadratic elements - Lagrange & Serendipity elements.

**UNIT IV ANALYSIS OF NONLINEAR AND VIBRATION PROBLEMS: 12**  
Strain displacement matrix - Material and Geometric Nonlinearity - Methods of Treatment -Dynamic condensation-Eigen value extraction

**UNIT V ASSEMBLAGE OF ELEMENT: 12**  
Assemblage of elements – Direct stiffness method. Special characteristics of stiffness matrix - Boundary condition & reaction - Gauss elimination –Basic steps in Finite element analysis.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Krishnamoorthy, C.S, Finite Element Analysis Theory & Programming, McGraw- Hill
2. Desai C.S and Abel, J.F., Introduction to the finite element Method, Affiliated East west Press Pvt. Ltd. New Delhi 1997.
3. Bathe , K.J., Finite Elements Procedures in Engineering analysis, Prentice Hall Inc., 1995.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



**19255L24P**

**SOFTWARE LAB**

**L T P C**  
**0 0 3 3**

**AIM:**

To impart knowledge to analyze solve, design and Civil Engineering drawings using FEA - ANSYS

**OBJECTIVES:**

- To learn the basic concepts of computing.
- To know the methodology of problem solving.
- To develop Civil Engineering drawing using FEA – ANSYS

**LIST OF EXPERIMENTS**

1. Calculate the displacement and the member forces / reaction for the given simple truss with concentrated loads.
2. Calculate the displacement and the member forces / reaction for the given Stepped shaft subjected to temperature change.
3. Calculate the displacement and the member forces / reaction for the given beam with concentrated and distributed loads.
4. Find the natural frequencies and mode shapes of a given cantilever beam.
5. Find the maximum normal stress and stress concentration factor for the given plate with hole.

**REFERENCES:**

1. Fundamentals of Finite element analysis, David V. Hulton, Publisher- MC Graw – Hill Science.

19255CRMP

RESEARCH METHODOLOGY

L T P C  
3 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:**

- 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**

9

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**

9

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**

9

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**

9

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.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## 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.

**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.

19255C31P

**SEMESTER III  
STRUCTURAL DYNAMICS**

**L T P C  
3 1 0 4**

**AIM & OBJECTIVES:**

This course covers the methods for analyzing the stresses and deflections developed in any given type of structures when it is subjected to an arbitrary dynamic loading.

**UNIT I PRINCIPLES OF DYNAMICS 12**

Formulation of equations of motion by different methods, single degree freedom systems, free and forced response, effect of damping.

**UNIT II MULTIDEGREE OF FREEDOM SYSTEMS 12**

Formulation of structure property matrices, Eigen values problems, Modes shapes and orthogonality of modes, Approximate methods of extraction of eigen values.

**UNIT III DYNAMIC RESPONSE OF MDOF SYSTEMS 12**

Mode superposition techniques, Numerical integration procedures.

**UNIT IV CONTINUOUS SYSTEMS 12**

Modeling - free and forced vibration of bars and beams.

**UNIT V APPLICATIONS 12**

Idealisation of structures to mathematical models, examples of wind, earthquake and impact

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Mario Paz, Structural Dynamics, CBS, Publishers, 1987.
2. Roy R Craig, Jr., Structural Dynamics, John Wiley & Sons, 1981.
3. Clough and Penzien, (2000), Dynamics of Structures, Second Edition, McGraw Hill Book Company.

**19255C32P MAINTENANCE & REHABILITATION OF STRUCTURES L T P C**  
**3 1 0 4**

**AIM and OBJECTIVES:**

Introduction to the governmental quality assurance regulations for public works. Application of quality control concepts, statistical experimental design principles to the construction process to minimize project costs and improve quality.

**UNIT I INTRODUCTION 12**

Definitions: Maintenance, repair and rehabilitation, Facets of and importance of Maintenance Preventive measures on various aspects Inspection, Assessment procedure for evaluating a damaged structure causes of deterioration-testing techniques.

**UNIT II METEOROLOGICAL EFFECTS 12**

Effects due to climate, temperature, chemicals, wear and erosion, Design and construction errors, corrosion mechanism, Effects of cover thickness and cracking, methods of corrosion protection

**UNIT III QUALITY CONTROL 12**

Quality assurance for concrete construction as built concrete properties strength, permeability, thermal properties and cracking.

**UNIT IV MATERIALS AND TECHNIQUES FOR REPAIR 12**

Special concretes and mortar, concrete chemicals, Expansive cement, polymer concrete, sulphur infiltrated concrete, Ferro cement, Fiber reinforced concrete. Rust eliminators and polymers coating for rebar during repair foamed concrete, mortar and dry pack, vacuum concrete, Guniting and Shot Crete Epoxy injection, Mortar repair for cracks, shoring and underpinning.

**UNIT V DEMOLITION 12**

Engineering demolition of structures – case studies

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Raikar, R.N., " Learning from failures - Deficiencies in Design ", Construction and Service , R & D Centre (SDCPL), Raikar Bhavan, Bombay, 1987.
2. Allen R.T., and Edwards S.C, *Repairs of Concrete Structures*, Blaike and Sons, U.K 1987.
3. Santhakumar, A.R., " Training Course notes on Damage Assessment and repair in Low Cost Housing ", " RHDC-NBO " Anna University, July, 1992.
4. N.Palaniappan, "Estate Management, Anna Institute of Management ", Chennai, 1992.
5. Lakshmi pathy, Metal Lecture notes of Workshop on "Repairs & Rehabilitation of Structures ", 29 - 30th October 1999.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



6.Durham, (2003), Advanced Concrete Design, Oxford Publishing private Limited.

**19255C42P**

**ADVANCED STEEL STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIM & OBJECTIVES:**

Introduction to steel structure, tensioned member, compressed member, beam, design of beam and column, bolt jointing, welding jointing and other joint design.

**UNIT I COMPRESSION MEMBERS 12**  
Design of compression members – Axially – Uni axial and biaxial bending.

**UNIT II PLASTIC ANALYSIS 12**  
Plastic Analysis of Structures – Introduction - Shape factors – Mechanisms - Plastic hinge - Analysis of beams and portal frames - Design of continuous beams.

**UNIT III LIGHT WEIGHT STEEL STRUCTURES 12**  
Design of Light Gauge Steel Structures - Types of cross sections - Local buckling and lateral buckling - Design of compression and tension members – Beams - Deflection of beams.

**UNIT IV LIMIT STATE DESIGN 12**  
Limit state design of Steel Structures – Plastic section – Section classification – Partial safety factor.

**UNIT V DESIGN OF JOINTS AND CONNECTIONS 12**  
Design of joints and connections – Riveted – Bolted – Welded – Semi rigid connection.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Horne, M.R., and Morris, L.J., (1996), Plastic Design of Low-rise frames, Granada Publishing Ltd; N.Y.
2. Salmon, C.G., and Johnson, J.E., (2000), Steel Structures – Design and Behaviour, Harper and Row.
3. Kuzamanovic, B.O. and Williams, N., (1997), Steel Design for Structural Engineers, Prentice Hall.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## ELECTIVE-I

19255E23AP

FAILURE ANALYSIS OF STRUCTURES

L T P C

3 1 0 4

### AIM & OBJECTIVES:

This course introduces about the failure of structures, buckling failure of columns, deterioration of wood and miscellaneous failures.

#### UNIT I INTRODUCTION 12

Causes of failure – Types of failure – durability of materials – various durability tests on materials.

#### UNIT II STRUCTURAL FAILURE 12

Structural failure – material and load effects – environment effect - Non-structural and structural repairs

#### UNIT III BUCKLING FAILURE ON COLUMNS 12

Buckling of columns with various end conditions - Elastically supported columns- non prismatic columns - Built-up columns - Inelastic buckling, Experimental study of column behavior, Empirical column formulae.

#### UNIT IV DETERIORATION OF WOOD 12

Defects on wood – improper seasoning and defects – improving of surface of wood.

#### UNIT V MISCELLANEOUS FAILURES 12

Pin-jointed And rigid jointed frames – concrete walls - arches – reinforced concrete beams and frames – repair of concrete bridge and water retaining structures.

**TOTAL: 60 PERIODS**

### REFERENCES

1. Rasnom, W.H., Building Failures, E&F, N. SPON Ltd.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



2. Moskvina V, Concrete and Reinforced Structures – Deterioration and Protection, Mir Publishers, Moscow, 1980.

**19255E23BP**

**ADVANCED CONCRETE TECHNOLOGY**

**L T P C**

**3 1 0 4**

**AIM & OBJECTIVES:**

To learn the Performance of concrete as structural material and advanced technologies used in construction by using concrete.

**UNIT I INTRODUCTION TO CONCRETE 12**

Materials - Concrete materials - Reinforcements and admixtures.

**UNIT II MIX DESIGN 12**

Mix Design – Specifications - Design of concrete mixes by IS code method – ACI method - Road Note No:4 method – High strength concrete.

**UNIT III BEHAVIOUR OF CONCRETE 12**

Behavior of Concrete - Modern trends in concrete manufacture and placement techniques - Theological behavior of fresh concrete and hardened concrete - Resistance to static and dynamic loads.

**UNIT IV TESTING 12**

Testing of Concrete - Non-destructive testing and quality control – Durability - Corrosion protection and fire resistant.

**UNIT V SPECIAL CONCRETE 12**

Special Concrete - Pre-cast concrete - Light weight concrete - Under water concrete -Pumped concrete - Polymer concrete - Composites and fibre reinforced concrete.

**TOTAL: 60 PERIODS**

**REFERENCES :**

1. Neville, A.M.(2003), Properties of Concrete, Standard Publishers Distributors.
2. Varshney(2000), Concrete Technology, Khanna Publishers, New Delhi.
3. IS : 383 – 1970, (2005), Specification for Coarse and fine natural sources for Concrete, BIS, New Delhi.
4. IS : 9103-1979, (2005), Specification for Admixtures for Concrete, BIS, New Delhi

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**



2. Owens, G.W. and Knowels.P. Steel Designers manual (Fifth edition), Steel Concrete Institute (UK) Oxford Blackwell Scientific Publications, 1992.
3. Workshop on Steel Concrete Composite Structures, conducted at Anna University, 2000.

## ELECTIVE- II

**19255E33AP**

**PRESTRESSED CONCRETE DESIGN**

**L T P C**

**3 1 0 4**

**AIM & OBJECTIVES:**

This course introduces students to the fundamental principles of pre-stressed concrete behavior and design, So that they can act effectively to optimize existing forms of construction and apply fundamental concepts with confidence in unusual and challenging situations.

**UNIT I INTRODUCTION**

**12**

Difference between reinforced and pre-stressed concrete – Principles of pre-stressing – Methods and systems of pre-stressing – Principles of electro thermal pre-stressing and chemical pre-stressing – Classification of pre-stressed concrete structures – Materials – High strength concrete and High strength steel – Stress-strain diagram - Losses in pre- stress.

**UNIT II LIMIT STATE DESIGN**

**12**

Design of prismatic pre-stressed concrete members for bending at working loads –Check for ultimate load stage (Limit State Design).

**UNIT III BEHAVIOR OF BEAMS**

**12**

Simple cable profiles – Calculation of deflections – Design of beams for shear and torsion at working and ultimate loads. Design of Anchorage zone by Guyon’s method – Concept of Magnel’s method – IS 1343 recommendations.

**UNIT IV COMPOSITE BEAMS**

**12**

Composite pre-stressed concrete beams – Design procedure – Calculation of stresses at important stages both for propped and un propped constructions – Shrinkage stresses.

**UNIT V BEHAVIOR OF CONTINUOUS BEAMS**

**12**

Statically indeterminate structures – Concept of concordant cable and linear transformations – Sketching of pressure lines for continuous beams – Circular pre stressing.

**TOTAL: 60 PERIODS**

**REFERENCES:**

1. Leonhardt.F., Prestressed Concrete, Design and Construction, Wilhelm Ernst and Shon, Berlin, 1964.
2. Freyssinet, Prestressed Concrete

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

3. Krishna Raju, N. Advanced Reinforced Concrete Design, CBS Publishers and Distributors, 1986.
4. Rajagopal N, (2005), Prestressed Concrete, Second Edition, Narosa Publishing House.
5. Dayarathnam P, (2004), Prestressed Concrete Structures, S.Chand Publishers.

**19255E33BP**

**HIGH RISE STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIM & OBJECTIVES:**

This course covers the design criteria and loading pattern on high rise structures, behavior of structural systems and stability, design and analysis of tall buildings.

**UNIT I DESIGN CRITERIA 12**

Design philosophy, Loading, Sequential loading and materials - high performance Concrete - Fiber reinforced Concrete - Light weight Concrete - Design mixes.

**UNIT II LOADING AND MOVEMENT 12**

Gravity Loading: Dead and live load, methods of live load reduction, Impact, gravity loading, construction load. Wind loading: Static and dynamic approach, Analytical and wind tunnel experimental method. Earthquake loading: Equivalent lateral force, modal analysis, combinations of loading working stress design, Limit state design, plastic design.

**UNIT III BEHAVIOUR OF VARIOUS STRUCTURAL SYSTEMS 12**

Factors affecting growth, Height and Structural form. High rise behavior, Rigid frames, braced frames, In filled frames, shear walls, coupled shear walls, wall-frames, tubular, cores, outrigger - braced and hybrid mega system.

**UNIT IV ANALYSIS AND DESIGN 12**

Modeling for approximate analysis, Accurate analysis and reduction techniques, Analysis of building as total structural system considering overall integrity and major subsystem interaction, Analysis for member forces, drift and twist, computerized general three dimensional analysis. Structural elements: Sectional shapes, properties and resisting capacity, design, deflection, cracking, pre stressing, shear flow. Design for differential movement, creep and shrinkage effects, temperature effects and fire resistance

**UNIT V STABILITY OF TALL BUILDINGS 12**

Overall buckling analysis of frames, wall-frames, Approximate methods, second order effects of gravity of loading, P-Delta analysis, simultaneous first-order and P-Delta analysis, Translational, Torsional instability, out of plum effects, stiffness of member in stability, effect of foundation rotation

**TOTAL: 60 PERIODS**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

## REFERENCES:

1. Dr. Y.P.Gupta, Editor. Proceedings National Seminar on High Rise Structures - Design and Construction practices for middle level cities Nov. 14 -16, 1995, New Age International Limited, Publishers, Madras - 20.
2. Wilf gang Schuller, High Rise Building Structures, John Wiley and Sons, 1977.
3. Bryan stafford Smith, Alexcoull, Tall Building Structures , Analysis and Design, John Wiley and Sons, Inc., 1991.
4. T.Y.Lin, D.Stotes Burry, Structural Concepts and system for Architects and Engineers. John Wiley, 1988.

**19255E33CP**

**COMPUTER AIDED STRUCTURAL DESIGN**

**L T P C**

**3 1 0 4**

### AIM:

To learn design and preparation of structural drawing of concrete and steel structures (STADD-PRO).

### OBJECTIVES:

At the end of the course the students acquires hands on experiences in design and Preparation of structural drawing for concrete and steel structures normally encountered in Civil Engineering practice.

### UNIT I COMPUTER GRAPHICS

**12**

Graphic primitives - Transformations - Basics of 2-D drafting - Modeling of curves and surfaces - Solid modeling Graphic standards - Drafting software packages and usage.

### UNIT II STRUCTURAL ANALYSIS

**12**

Computer methods of structural analysis - Finite Element programming - Analysis through application packages.

### UNIT III STRUCTURAL DESIGN

**12**

Computer aided design of steel and RC Structural elements - Detailed drawing - Bill of materials.

### UNIT IV OPTIMIZATION

**12**

Linear programming - Simplex algorithm - Post-optimality analysis - Project scheduling - CPM and PERT applications Genetic algorithm and applications.

### UNIT V ARTIFICIAL INTELLIGENCE

**12**

Introduction - Heuristic search - knowledge based expert systems - Architecture and applications of KBES - Expert system shells - Principles of neural network.

**TOTAL: 60 PERIODS**

## REFERENCES

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

1. C..S.Krishnamoorthy and S.Rajeev, Computer Aided Design, Narosa Publishing House, New Delhi, 1991.
2. H.B.Harrison, Structural Analysis and Design Vol.I & II, Pergamon Press, 1991 E.Hinton and D.R.J.Owen, Finite Element Programming, Academic Press 1977.
3. Billy E.Gillet, Introduction to Operations Research, A computer oriented algorithmic approach, Tata McGraw Hill 1982.
4. Richard Forsyth (Ed.), Expert System Principles and Case studies - Chapman & Hall.

### ELECTIVE- III

<b>19255E43AP</b>	<b>OPTIMIZATION IN STRUCTURAL DESIGN</b>	<b>L T P C</b>
		<b>3 1 0 4</b>

#### AIM & OBJECTIVES:

The structural analysis is formulated through the principle of optimization. Both the manual calculation and application of the computer are introduced for the analysis of truss and frame structures using optimization techniques.

<b>UNIT I INTRODUCTION</b>	<b>12</b>
Basic concepts of minimum weight, minimum cost design, Objective function, constraints and classical methods.	

<b>UNIT II OPTIMIZATION TECHNIQUES</b>	<b>12</b>
Linear programming, Integer Programming, Quadratic Programming.	

<b>UNIT III ALGORITHMS</b>	<b>12</b>
Dynamic Programming and Geometric Programming methods for Optimal design of structural elements.	

<b>UNIT IV COMPUTER SEARCH METHODS</b>	<b>12</b>
Linear Programming methods for plastic design of frames, Computer search methods for univariate and multivariate Minimization.	

<b>UNIT V OPTIMIZATION BY STRUCTURAL THEOREMS</b>	<b>12</b>
Maxwell, Mitchell and Heyman's Theorems for trusses and frames, fully stresses design with deflection constraints, optimality criterion methods.	

**TOTAL: 60 PERIODS**

#### REFERENCES

1. Spunt, Optimum Structural Design, Civil Engineering and Engineering Mechanics Services, Prentice-Hall, New Jersey 1971.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

2. S.S.Rao, Optimization Theory and Applications, Wiley Eastern Limited, New Delhi, 1977.
3. Uri Krisch, Optimum Structural Design, McGraw Hill Book Co. 1981.
4. Richard Bronson, Operation Research, Schaum's Outline Series, McGraw Hill Book Co, Singapore, 1983.

**19255E43BP**

**DESIGN OF INDUSTRIAL STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIM & OBJECTIVES:**

This course deals about the requirements, planning and construction techniques of an industry. And also deals with modes of communication and transport to be used in an industrial structures.

**UNIT I REQUIREMENTS OF AN INDUSTRY 12**

General - Specific requirements for industries like textile, sugar, cement, chemical, etc - Site layout and external facilities.

**UNIT II PLANNING 12**

Planning of Building Work – Standards - Structural materials including plastics – Polymers - Fibre glass - Pressed card boards, etc - Multi-storey buildings - Steel skeletal structures - Reinforced concrete frames – Workshops - Ware houses - Single storey buildings - Sheds in steel and reinforced concrete - North-lights - Single span spherical and other special constructions - Cooling towers and chimneys - Bunkers and silos' prefabrication - Construction.

**UNIT III CONSTRUCTION TECHNIQUES 12**

Construction Techniques - Expansion joints - Machine foundations - Other foundations - Water proofing - Roofs and roofing - Roof drainage - Floors and flooring joists - Curtain walling - Outer wall facing - Sound and shock proof mountings - Use of modern hoisting and other construction equipments.

**UNIT IV COMMUNICATION AND TRANSPORT 12**

Circulation - Communication and Transport - Fixed points ( central cores) – Staircases -Grid floor sections - Lifts refuse disposals - Utilization of waste materials – Cranes - Continuous conveyors - Mobile cranes – Transporters – Doors - Sliding gates.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT V FUNCTIONAL REQUIREMENTS****12**

Functional Requirements – Lighting: Natural lighting - Protection from the sun - skylights - window cleaning installations -Services: Layout – wiring – fixtures - cable and pipe bridges - electrical installations - lighting substation - Effluent. Ventilation and fire protection: Ventilation - Air-conditioning - Fire escapes and chutes - Fire alarms - Extinguishers and hydrants.

**TOTAL: 60 PERIODS****REFERENCE**

1. Water Henn, (1998), Buildings for industry, John Wiley and sons.
2. Glover, (1997), Structural Pre cast Concrete, Tata McGraw Hill.

**19255E43CP****ELEMENTS OF EARTHQUAKE ENGINEERING****L T P C****3 1 0 4****AIM & OBJECTIVES:**

This course covers the theory and applications related to Earthquake Engineering. The broad subjects discussed in this course include earthquake response of linearly elastic and inelastic buildings, structural dynamics in building codes.

**UNIT I ELEMENTS AND FEATURES****12**

Elements of Seismology - Definitions of magnitude – Intensity - Epicentre etc - General features of tectonics of seismic regions - Seismographs.

**UNIT II THEORY OF VIBRATIONS****12**

Theory of Vibrations - Free vibrations of single degree - Two degree and multiple degree freedom systems - Computations of dynamic response to time dependent forces - Vibrations isolation – Vibration absorbers - Brief introduction to instruments - Accelerograms.

**UNIT III PRINCIPLES OF EARTHQUAKE DESIGN****12**

Principles of earthquake resistant design - Response spectrum theory - Application of response spectrum theory to seismic design of structures. Capacity - Design Principles - Design criteria for strength - Stiffness and ductility.

**UNIT IV EARTHQUAKE ANALYSIS****12**

Earthquake Analysis and Design - Characteristics of earthquake – Earthquake response of structures – Concept of earthquake resistance design – Code provisions for design of building – IS 1893 and IS 4326 – Energy absorption capacity.

**UNIT V COMPUTER APPLICATION****12**

Seismic analysis and design of a multi storied building using Computer.

**TOTAL: 60 PERIODS****SKILL DEVELOPMENT****EMPLOYABILITY****ENTREPRENEURSHIP**



## REFERENCE

1. Pauley & Priestly, (1992), Seismic design of reinforced concrete and masonry buildings, John Wiley & Sons.
2. Stratta.J.L, (1998), Manual of Seismic Design, Prentice-Hall India Pvt Ltd.
3. Kramer.S.L., (2002), Geotechnical Earthquake Engineering, Prentice-Hall India Pvt Ltd.

### ELECTIVE- IV

19255E51AP

EXPERIMENTAL STRESS ANALYSIS

L T P C

3 1 0 4

#### AIM & OBJECTIVES:

At the end of the semester students can learn about the strain gauges, strain rosetters, model analysis, calibration of photo elastic materials.

#### UNIT I STRAIN GAUGES

12

Strain Gauges - Mechanical and optical strain gauges – Description and operation – Electrical resistance- Inductance and capacitance gauges – Detailed treatment on resistant gauges – Measurement of static and dynamic strains – Strain rosettes – Effect of transverse strains – Use of strain recorders and load cells.

#### UNIT II MODEL ANALYSIS

12

Model Analysis - Structural similitude – Use of models – Structural and dimensional analysis – Buckingham Pi Theorem – Muller Breslau's principle for indirect model analysis – Use of Begg's and Eney's deformeters – Moment indicators – Design of models for direct and indirect analysis.

#### UNIT III CALIBRATION

12

Two dimensional photo elasticity - Stress optic law – Introduction to polariscope – Plane and circular polariscope – Compensators and model materials – Material and model fringe value – Calibration of photo elastic materials – Isochromatic and isoclinic fringes – Time edge effects.

#### UNIT IV PHOTO ELASTICITY

12

Three dimensional photo elasticity - Introduction – Stress freezing techniques – Stress separation techniques – Scattered light photo elasticity – Reflection polariscope.

#### UNIT V MISCELLANEOUS METHODS

12

Brittle coating method – Birefringence techniques – Moire fringe method – Non-destructive testing – Ultrasonic pulse velocity technique – Rebound hammer method – X-ray

SKILL DEVELOPMENT

EMPLOYABILITY

ENTREPRENEURSHIP

method – Gamma-ray method.

**TOTAL: 60 PERIODS**

**REFERENCE**

1. Dally J.W., Riley W.F., Experimental Stress Analysis, McGraw Hill Book Company, New York.
2. Heteny M; Handbook of Experimental Stress Analysis, John Wiley and Sons, New York.
3. Frocht M.M.; Photoelasticity Vol. I & II. John Wiley and Sons, New York.

**19255E51BP**

**SOIL STRUCTURE INTERACTION**

**L T P C**  
**3 1 0 4**

**AIM & OBJECTIVES:**

This course deals with the soil- foundation interaction, analysis of beams and finite plates, elastic analysis of pile, load deflection for laterally loaded pile.

**UNIT I SOIL-FOUNDATION INTERACTION 12**

Introduction to soil-Foundation interaction problems, soil behaviour, Foundation behavior, Interface behavior, Scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic models, Elastic plastic behavior, Time dependent behavior

**UNIT II BEAM ON ELASTIC FOUNDATION- SOIL MODELS 12**

Infinite beam, two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness

**UNIT III PLATE ON ELASTIC MEDIUM 12**

Infinite plate, Winkler, Two parameters, isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions

**UNIT IV ELASTIC ANALYSIS OF PILE 12**

Elastic analysis of single pile, Theoretical solutions for settlement and load distributions, analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

**UNIT V LATERALLY LOADED PILE 12**

Load deflection prediction for laterally loaded piles, Sub grade reaction and elastic analysis, Interaction analysis, Pile raft system, Solutions through influence charts

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**TOTAL: 60 PERIODS**

**References:**

1. Selva durai, A.P.S., Elastic Analysis of Soil Foundation Interaction, Elsevier,1979
2. Poulos, H.G., and Davis,E.H., Pile Foundation Analysis and Design, John Wiley,1980
3. Scott,R.F.,Foundation Analysis,Prentice Hall,1981
4. Structure Soil Interaction - State of Art Report,Institution of Structural Engineers,1978.
5. ACI 336, Suggested Analysis and Design Procedures for combined footings and Mats, American Concrete Institute, Delhi, 1988

**19255E51CP**

**ASEISMIC DESIGN OF STRUCTURES**

**L T P C**

**3 1 0 4**

**AIMS &OBJECTIVES:**

This course deals about seismology, seismic design concepts, codal provisions and detailing of frames.

**UNIT I INTRODUCTION**

**12**

Elements of Engineering Seismology - Theory of Vibration - Response Spectrum.

**UNIT II HISTORICAL**

**12**

Indian Seismicity - Earthquake History - Behaviour of Structures in the past Earthquakes.

**UNIT III DESIGN CONCEPTS**

**12**

Seismic Design Concepts - Cyclic load behaviour of RC, Steel and Prestressed Concrete elements – Design spectrum - Principles of capacity design.

**UNIT IV CODAL PROVISIONS**

**12**

Provisions of Seismic Code (IS 1893) - Building systems frames, shear walls, Braced Frames, Combinations - Torsion.

**UNIT V DESIGN AND DETAILING**

**12**

Performance of Regular Buildings 3 D Computer Analysis of Building Systems (Theory Only) - Design and Detailing of frames - Shear walls and Frame walls.

**TOTAL: 60 PERIODS**

**References:**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

1. Course Notes "Design of Reinforced Concrete Building", IIT, Kanpur, June 1999.
2. Bungale S.Taranath "Structural Analysis and Design of Tall Buildings" McGraw Hill Book Company, New York, 1999.

<b>19255E52AP</b>	<b>ELECTIVE V PREFABRICATED STRUCTURES</b>	<b>L T P C 3 1 0 4</b>
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**AIMS & OBJECTIVES:**

This course explains about design principles of Prefabricated Structures, components, application of prefabricated structures. Students can learn the usage of prefabricated structures in wall panels, industrial buildings and shell roofs.

**UNIT I DESIGN PRINCIPLES 12**  
 General Civil Engineering requirements- IS Code specifications. Modular co-ordination, standardization- Disuniting of Prefabricates, production, transportation, and erection-Safety factors, material properties, Deflection control.

**UNIT II REINFORCED CONCRETE 12**  
 Prefabricated structures - Long wall and cross-wall large panel buildings- One way and two way prefabricated slabs- Framed buildings with partial and curtain walls- Connections – Beam to column and column to column

**UNIT III FLOORS, STAIRS AND ROOFS 12**  
 Types of floor slabs, analysis and design example of cored and panel - Staircase slab design, types of roof slabs and insulation requirements- Description of joints, their behavior and reinforcement requirements- Ultimate strength calculations in shear and flexure

**UNIT IV WALL 12**  
 Types of wall panels, Blocks and large panels, Curtain- Partition and load bearing walls, load transfer from floor to wall panels- Design Curves, types of wall joints, their Behaviour and design

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

-Leak prevention, joint sealants, sandwich wall panels

## **UNIT V INDUSTRIAL BUILDINGS AND SHELL ROOFS**

**12**

Components of single-storey industrial sheds with crane gantry systems- R.C. Roof Trusses, Roof Panels, corbels and columns- Cylindrical, Folded plate and hyper-prefabricated shells-Erection and jointing, joint design, hand book based design

**TOTAL: 60 PERIODS**

### **REFERENCE BOOKS**

1. Murashev.V., Sigalov.E., and Bailov.V., Design of Reinforced Concrete Structures, Mir Publishers
2. Gerostiza. C.Z., Hendrikson, C. and Rehat D.R., Knowledge Based Process Planning for Construction and Manufacturing, Academic Press, Inc
3. Hass, A.M. Precast Concrete Design and Applications, Applied Science Publishers, 1983.

**19255E52BP**

**DISASTER RESISTANT STRUCTURES**

**L T P C**

**3 1 0 4**

### **AIMS & OBJECTIVES:**

This course deals the philosophy of the design of disaster resistant structures such as dams, bridges and emphasize about the rehabilitation, retrofitting and damage assessment of structures.

## **UNIT I BEHAVIOUR OF LIFE-LINE STRUCTURES**

**12**

Philosophy for design to resist earthquake, cyclone and flood - National and International codes of practice - By-Law of urban and semi-urban areas - Traditional and modern structures.

## **UNIT II COMMUNITY STRUCTURES**

**12**

Response of dams, bridges, buildings - Strengthening measures - Safety analysis and rating – Reliability assessment.

## **UNIT III REHABILITATION AND RETROFITTING**

**12**

Testing and evaluation - Classification of structures for safety point of view - methods of strengthening for different disasters - qualification test.

## **UNIT IV DETAILING OF STRUCTURES AND COMPONENTS**

**12**

Use of modern materials and their impact on disaster reduction - Use of modern analysis, design and construction techniques optimization for performance.

## **UNIT V DAMAGE ASSESSMENT OF STRUCTURES**

**12**

Damage surveys - Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety - Ground improvement techniques.

**TOTAL: 60 PERIODS**

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**TEXT BOOKS:**

1. V.Moskvin , et.al Concrete and Reinforced Concrete - Deterioration and Protection - Mir Publishers - Moscow 1980.
2. R.T.Allen and S.C.Edwards, Repair of Concrete Structures, Blakie and Sons, U.K 1987.

**REFERENCES:**

1. Proceedings IABSE 14th Congress "Civilization through Civil Engineering" New Delhi May 1992.
2. Raiker R.N.Learning from failures Deficiencies in Design, Construction and Service , R & D Center (SDCPL) Raiker Bhavan, Bombay, 1987.

**19255E52CP****NONLINEAR ANALYSIS OF STRUCTURES****L T P C  
3 1 0 4****AIMS & OBJECTIVES:**

This course deals about the non –linearities, non-linear equations and non linear static analysis of plates, columns, trusses and frames.

**UNIT I TYPES OF NONLINEARITIES 12**

Geometric Nonlinearity, Material Nonlinearity, Nonlinear Governing Equation for Beams: Moment-curvature Nonlinearity, Geometric Nonlinearity Due to Stretching, Material Nonlinearity, Geometrically Nonlinear Beam Problems - Moment-Curvature Nonlinearity- Cantilever Beam, Centrally Loaded beam with two supports, Cantilever Beam subjected to TipLoad

**UNIT II NONLINEAR EQUATIONS OF PLATES 12**

Nonlinear Static Analysis of Plates - Geometric and Material Nonlinearities, Governing Stress Function Approach, Displacement Equations Approach

**UNIT III NONLINEAR STATIC ANALYSIS OF PLATES 12**

Boundary Conditions and method of solution, Large Deflection of Rectangular Plates.

**UNIT IV NONLINEAR ANALYSIS OF COLUMNS 12**

Post buckling of cantilever column, large deflection of column with both ends hinged

**UNIT V NONLINEAR ANALYSIS OF TRUSSES AND FRAMES 12**

Nonlinear Analysis of Trusses and Nonlinear Elastic Analysis of Frames - Derivation of non linear stiffness matrix, Matrix displacement method for nonlinear analysis of structures, nonlinear

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

analysis of plane frames.

**TOTAL: 60 PERIODS**

**REFERENCE:**

1. M.Sathyamoorthy, 'Nonlinear Analysis of Structures', CRC Press, New York
2. K.I. Majid, 'Non Linear Structures', Butter worth Publishers, London.
3. N G R Iyengar, 'Elastic Stability of Structural elements', Macmillan India Ltd

**ELECTIVE VI**

**19255E53AP**

**OFFSHORE STRUCTURES**

**L T P C**  
**3 1 0 4**

**AIMS & OBJECTIVES:**

This course includes the details of wave theories, forces in offshore structures and design and analysis of offshore structures .

**UNIT I WAVE THEORIES 12**

Wave generation process, small and finite amplitude wave theories.

**UNIT II FORCES OF OFFSHORE STRUCTURES 12**

Wind forces, wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.

**UNIT III OFFSHORE SOIL AND STRUCTURE MODELING 12**

Different types of offshore structures, foundation modeling, and structural modeling.

**UNIT IV ANALYSIS OF OFFSHORE STRUCTURES 12**

Static method of analysis, foundation analysis and dynamics of offshore structures.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

**UNIT V DESIGN OF OFFSHORE STRUCTURES****12**

Design of platforms, helipads, Jacket tower and mooring cables and pipe lines.

**TOTAL: 60 PERIODS****References:**

1. Chakrabarti, S.K. Hydrodynamics of Offshore Structures, Computational Mechanics Publications, 1987.
2. Thomas H. Dawson, Offshore Structural Engineering, Prentice Hall Inc Englewood Cliffs, N.J. 1983
3. API, Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms, American Petroleum Institute Publication, RP2A, Dalls, Tex.
4. Wiegel, R.L., Oceanographical Engineering, Prentice Hall Inc, Englewood Cliffs, N.J. 1964.
5. Brebia, C.A.Walker, S., Dynamic Analysis of Offshore Structures, Newnes Butterworth's, U.K. 1979.
6. Reddy, D.V. and Arockiasamy, M., Offshore Structures, Vol.1, Krieger Publishing Company, Malabar, Florida, 1991.

**19255E53BP****STABILITY OF STRUCTURES****L T P C****3 1 0 4****AIMS & OBJECTIVES:**

This course deals with the concept and characteristics of stability problems and behavior of torsional buckling and lateral buckling in beams and columns.

**UNIT I INTRODUCTION****12**

Concept of stability approaches to stability analysis, characteristics of stability problems.

**UNIT II COLUMNS****12**

Buckling of columns with various end conditions, imperfect columns, elastically supported columns, non prismatic columns, Built-up columns, Inelastic buckling, Experimental study of column behavior, Empirical column formulae. Buckling of bars on elastic foundations, large deflection of buckled bars.

**UNIT III BEAMS – COLUMNS****12**

Beam-column theory, Application to buckling of frames.

**UNIT IV TORSIONAL BUCKLING****12**

Combined torsional and flexural buckling.

**UNIT V LATERAL BUCKLING****12**

Lateral buckling of beams, pure bending of simply supported beam and cantilever, numerical solutions.

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



**TOTAL: 60 PERIODS**

**REFERENCES BOOKS:**

1. Allen, H.G., and Bulson, P.S., Background to Buckling, McGraw Hill Book Company, 1980.
2. Smits, Elastic Stability of Structures, Prentice Hall, 1973.
3. Timoshenko, S., and Gere., Theory of Elastic Stability, McGraw Hill Book Company, 1961.
4. Brush and Almoth., Buckling of Bars, Plates and Shells, McGraw Hill Book Company, 1975.
5. Chajes, A. Principles of Structures Stability Theory, Prentice Hall, 1974.
6. Ashwini Kumar, Stability Theory of Structures, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1985.

**19255E53CP**

**MECHANICS OF COMPOSITE MATERIALS**

**L T P C**

**3 1 0 4**

**AIMS & OBJECTIVES:**

This course introduces the properties of materials, strength and elastic behavior of composite lamina and design of composite structures.

**UNIT I INTRODUCTION TO MODERN MATERIALS 12**

Fiber-Reinforced Polymer Composite (FRPC) Materials: Definition, Historical development, applications. Fibers and Matrix, types and their properties. Manufacturing process and methods for composites. Types and classification of composite materials, properties, advantages over conventional materials. Piezoelectric Materials: History, crystal structure, applications. Shape Memory Alloys (SMA), Functionally Graded Materials (FGM): definition and applications.

**UNIT II ENGINEERING PROPERTIES OF MODERN MATERIALS 12**

FRPC Composite Lamina: Micromechanics approach, methods. Longitudinal and transverse elastic properties of composite lamina, in-plane shear modulus for continuous fibers. Stress-strain relationship, compliance and stiffness matrices for generally anisotropic, specially orthotropic material, transversely isotropic material, orthotropic, isotropic materials, Plane stress condition for thin lamina, transformation of stress and elastic properties. Three dimensional transformations. Piezoelectric Materials: Piezoelectric coefficients, electric displacements, piezoelectric strain matrix for Quartz, Lead Zirconate-titanate, Polyvinylidene fluoride. Stiffness matrix for Functionally Garded materials.

**SKILL DEVELOPMENT**

**EMPLOYABILITY**

**ENTREPRENEURSHIP**

### **UNIT III STRENGTH OF COMPOSITE LAMINA 12**

Introduction. Failure theories, Maximum stress theory, Maximum strain theory, Energy based interaction theory (Tsai-Hill), Interactive tensor polynomial theory (Tsai-Wu), Failure mode based theory (Hasin-Rotem). Computation of lamina strength by Tsai-Wu theory for plane stress condition. Comparison of various failure theories.

### **UNIT IV ELASTIC BEHAVIOUR OF COMPOSITE LAMINATES 12**

Basic assumptions, Laminate configurations, Strain displacement relationship, Stress-strain relationship, Force and moment resultants, Laminate compliances and stiffness matrices, Transformation of matrices. Load deformation relationship for symmetric laminates, symmetric cross-ply, symmetric angle-ply, balanced, antisymmetric cross-ply and angle ply, orthotropic, quasi-isotropic laminates.

### **UNIT V HYGROTHERMAL EXPANSION AND DESIGN OF COMPOSITE STRUCTURE 12**

Coefficients of thermal and moisture expansion of various unidirectional lamina, load deformation relationship, residual stresses for cross ply symmetric laminates. Design methodology, design of pressure vessel for various laminate configurations.

#### **REFERENCEBOOKS:**

1. Isaac M. Daniel and Ori Ishai - Engineering Mechanics of Composite Materials, Oxford University Press, Second Edition, New Delhi.
2. Michael W. Hyer - Stress Analysis of Fiber-Reinforced Composite Materials, WCB/McGraw-Hill, Singapore.
3. Jones R. M. – Mechanics of Composite Materials, McGraw-Hill, New York
4. Roman Solecki and R Jay Conant – Advanced Mechanics of Materials, Oxford University Press, New York, Special Edition for sale in India.