REGULATION
2020

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THANJAVUR- 613 403 - TAMIL NADU

INDEX

REGULATION - 2020

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School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 20 REGULATION -Mapping of cross cutting issues

ProgrammeName&Code			Course Code	TitleoftheCourse	CrosscuttingIssues			
					ProfessionalEthics	GenderSensitization	Human Values	Environmentand Sustainability
BTech(FT)	ECE	20UGECEFT	201AGIC	IndianConstitution			✓	
BTech(FT)	ECE	20UGECEFT	20149S46	EnvironmentalScience and Engineering	-	-	-	✓
BTech(FT)	ECE	20UGECEFT	20153FE54B	EnergyConservationand Management	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20154FE54A	RenewableEnergy Sources	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20155FE54A	AirPollutionandControl Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20150L17	Problem Solving and Basics of Python ProgrammingLab	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20149L18	PhysicsandChemistry Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201AGIT	InductionTraining Programme	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20147S21	TechnicalEnglish	✓	-	-	-
BTech(FT)	ECE	20UGECEFT	20148S22	EngineeringMathematics II	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20149S23B	Physicsfor Electronics Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20153S24B	CircuitAnalysis	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20153S25B	Basic Electrical And Instrumentation Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152S26B	ElectronicDevices				

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					-	-	-	-
BTech(FT)	ECE	20UGECEFT	20154L27	EngineeringPractices Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L28B	CircuitsandDevices Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201AGIC	IndianConstitution	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201ASBE	BasicBehavioral Etiquette	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20148S31B	Linear Algebra and Partial Differential Equations	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152S32	ControlSystems Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152S33	FundamentalsofData StructuresInC	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C34	DigitalElectronics	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C35	SignalsandSystems	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C36	ElectronicCircuits-I	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L37	FundamentalsofData Structures In C Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L38	AnalogandDigital CircuitsLaboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L39	InterpersonalSkills/ Listening&Speaking	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201AGGS	IntroductiontoGender Studies	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20148S41B	ProbabilityandRandom Processes	-	-	-	-

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BTech(FT)	ECE	20UGECEFT	20152C42	ElectronicCircuitsII	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C43	CommunicationTheory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C44	ElectromagneticFields	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C45	LinearIntegratedCircuits	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20149S46	EnvironmentalScience and Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L47	CircuitsDesignand SimulationLaboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L48	LinearIntegrated CircuitsLaboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201AGCE	CommunityEngagement	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201ASGS	Technical, General AptitudeandSkillset Development	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C51	DigitalCommunication	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C52	Discrete-TimeSignal Processing	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152S53	ComputerArchitecture and Organization	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C55	CommunicationNetworks	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L57	DigitalSignalProcessing Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L58	CommunicationSystems Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L59	Communication NetworksLaboratory				

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					-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C61	Microprocessorsand Microcontrollers	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C62	VLSIDesign	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C63	WirelessCommunication	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152S64	PrinciplesofManagement	✓	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C65	TransmissionLinesand RFSystems	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L61	Microprocessors and Microcontrollers Laboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L62	VLSIDesignLaboratory	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L63	Professional Communication	✓			
BTech(FT)	ECE	20UGECEFT	20152L64	TechnicalSeminar	-	-	-	-
BTech(FT)	ECE	20UGECEFT	201ASTT	TechnicalTraining	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C71	Antennas and Microwave Engineering	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C72	OpticalCommunication	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C73	EmbeddedandRealTime Systems	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152C75	AdhocandWireless SensorNetworks	-	-	-	-
BTech(FT)	ECE	20UGECEFT	20152L77	EmbeddedLaboratory	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 20 REGULATION -Mapping of cross cutting issues

BTech(FT)	**ECE**	**20UGECEFT**	**20152L78**	**Advanced Communication Laboratory**	-	-	-	-
BTech(FT)	**ECE**	**20UGECEFT**	**20152P83**	**ProjectWork**	-	-	-	-
BTech(FT)	**ECE**	**20UGECEFT**	**20152PEE**	**ProgrammeExit Examination**	-	-	-	-

1.3.1SUPPORTINGDOCUMENTS

Courses (offered in 2020-21) which address the Gender Sensitization, Human Values,

Professional Ethics, Environment and sustainability.

SCHOOLOFENGINEERINGANDTECHNOLOGY

DEPARTMENTOFELECTRONICSANDCOMMUNICATION

ENGINEERING

nder Sensitization and Human Values	
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fessional Ethics & Human Values	

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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

B.TECH – FULL TIME

[REGULATION 2020]

PROGRAMME EDUCATIONAL OBJECTIVES:

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

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

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

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

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

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

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

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

Contribution 1: Reasonable 2: Significant 3: Strong

B.TECH (FULL TIME) – ECE – R-2020

I - VIII SEMESTERS CURRICULUM

SEMESTER I

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

SEMESTER II

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

SEMESTER III

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

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
5.	20152C35	Signals and Systems	4	0	0	4
6.	20152C36	Electronic Circuits- I	3	0	0	3
PRACTICALS						
7.	20152L37	Fundamentals of Data Structures In C Laboratory	0	0	4	2
8.	20152L38	Analog and Digital Circuits Laboratory	0	0	4	2
9.	20152L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
		Soft Skills Course				
10.	201AGGS	Introduction to Gender Studies				2
		TOTAL	20	0	10	**27**

SEMESTER IV

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

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152C51	Digital Communication	3	0	0	3
2.	20152C52	Discrete-Time Signal Processing	4	0	0	4
3.	20152S53	Computer Architecture and Organization	3	0	0	3
4.	**201_ _OE54_**	**Open Elective – I**	3	0	0	3
5.	20152C55	Communication Networks	3	0	0	3
6.	**20152E56_**	**Elective – I**	3	0	0	3
PRACTICALS						
7.	20152L57	Digital Signal Processing Laboratory	0	0	4	2
8.	20152L58	Communication Systems Laboratory	0	0	4	2
9.	20152L59	Communication Networks Laboratory	0	0	4	2
		Soft Skills Course				
10.	201AGIE	Innovation and Entrepreneurship				2

TOTAL	22	**0**	12	**27**

SEMESTER VI

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

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20152C71	Antennas and Microwave Engineering	3	0	0	3
2.	20152C72	Optical Communication	3	0	0	3
3.	20152C73	Embedded and Real Time Systems	3	0	0	3
4.	**201_ _OE74_**	**Open Elective – II**	3	0	0	3
5.	20152C75	Adhoc and Wireless Sensor Networks	3	0	0	3
6.	**20152E76_**	**Elective – III**	3	0	0	3
PRACTICALS						
7.	20152L77	Embedded Laboratory	0	0	4	2
8.	20152L78	Advanced Communication Laboratory	0	0	4	2
		TOTAL	18	0	8	**22**

SEMESTER VIII

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

TOTAL NO. OF CREDITS:	**208**

LIST OF ELECTIVES

ELECTIVE - I (SEMESTER V)

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

ELECTIVE – II (SEMESTER VI)

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

ELECTIVE – III (SEMESTER VII)

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

ELECTIVE – IV (SEMESTER VIII)

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

ELECTIVE - V (SEMESTER VIII)

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

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – I (SEMESTER V)

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

OPEN ELECTIVE – II (SEMESTER VII)

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

B.TECH (FULL TIME) – ECE – R-2020

COURSE STRUCTURE AND CREDITS DISTRIBUTION

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

HOD **DEAN** **DEAN - ACADEMIC AFFAIRS**

SEMESTER I

20147S11 **COMMUNICATIVE ENGLISH**

L	T	P	C
4	0	0	4

OBJECTIVES:

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

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

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

UNIT 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 Undergarduate 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.

SEMESTER I

20148S12	**ENGINEERING MATHEMATICS I**	**L**	**T**	**P**	**C**
		4	**0**	**0**	**4**

OBJECTIVES:

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

UNIT I DIFFERENTIAL CALCULUS 12

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT III INTEGRAL CALCULUS 12

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

UNIT IV MULTIPLE INTEGRALS 12

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

UNIT V DIFFERENTIAL EQUATIONS 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

TEXT BOOKS :

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

REFERENCES :

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

SEMESTER I

20149S13 ENGINEERING PHYSICS

	L	T	P	C
	3	0	0	3

OBJECTIVES:

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

UNIT I PROPERTIES OF MATTER 9

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

UNIT II WAVES AND FIBER OPTICS 9

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

UNIT III THERMAL PHYSICS 9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat 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.

SEMESTER I

20149S14 ENGINEERING CHEMISTRY

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT 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_2-O_2 fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

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

SEMESTER I

20154S15	**ENGINEERING GRAPHICS**	**L**	**T**	**P**	**C**
		2	**0**	**4**	**4**

OBJECTIVES:

- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- T o 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, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., ―Engineering Drawing‖, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
3. Gopalakrishna K.R., ―Engineering Drawing‖ (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., ―Fundamentals of Engineering Drawing with an Introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
5. N S Parthasarathy And Vela Murali, ―Engineering Graphics‖, Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., ―Engineering Drawing‖, Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

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

SEMESTER I

20150S16 PROBLEM SOLVING AND BASICS OF PYTHON PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I ALGORITHMIC PROBLEM SOLVING 9

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

UNIT II DATA, EXPRESSIONS, STATEMENTS 9

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

UNIT III CONTROL FLOW, FUNCTIONS 9

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

UNIT IV LISTS, TUPLES, DICTIONARIES 9

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

UNIT V FILES, MODULES, PACKAGES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to

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

TEXT BOOKS:

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

REFERENCES:

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

SEMESTER I

20150L17 PROBLEM SOLVING AND BASICS OF PYTHON PROGRAMMING LAB

L	T	P	C
0	0	4	2

OBJECTIVES

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

LIST OF PROGRAMS

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

PLATFORM NEEDED

- Python 3 interpreter for Windows/Linux

OUTCOMES

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

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

TOTAL: 60 PERIODS

SEMESTER I

20149L18	**PHYSICS AND CHEMISTRY LABORATORY**		**L**	**T**	**P**	**C**
			0	**0**	**4**	**2**

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

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

TOTAL: 30 PERIODS

OUTCOMES:

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

apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:

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

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

OUTCOMES:

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

TOTAL: 30 PERIODS

TEXTBOOKS:

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

SEMESTER I

201AGIT **INDUCTION TRAINING PROGRAMME**

L	T	P	C
0	0	0	2

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

uction program	**3 weeks duration**
uction program for students to be offered right at the start of the first year.	• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

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

SEMESTER II

20147S21	**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- newsapapers- **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 cgarts, 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/ talkls 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 PERIODS :60

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

Additional Reading:

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

SEMESTER II

20148S22 ENGINEERING MATHEMATICS II

L	T	P	C
4	0	0	4

OBJECTIVES :

This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNIT I MATRICES 12

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS 12

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions w z c, cz, z^{-1} ,z^2 - Bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Line integral - Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS 12

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient, divergence and curl of a vector point function and related identities.
- Evaluation of line, surface and volume integrals using Gauss, Stokes and Green's theorems and their verification.
- Analytic functions, conformal mapping and complex integration.
- Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.

TEXT BOOKS :

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

REFERENCES :

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

SEMESTER II

20149S23B PHYSICS FOR ELECTRONICS ENGINEERING

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, 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 thorem – 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 NANOELECTRONIC 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 structuues,
- 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

SEMESTER II

20153S24B CIRCUIT ANALYSIS

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

OBJECTIVES:

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

UNIT I BASIC CIRCUITS ANALYSIS AND NETWORK TOPOLOGY 12

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

UNIT II NETWORK THEOREMS FOR DC AND AC CIRCUITS 12

Network theorems – Superposition theorem, Thevenin‘s theorem, Norton‘s theorem, Reciprocity theorem, Millman‘s theorem, and Maximum power transfer theorem, application of Network theorems- Network reduction: voltage and current division, source transformation – star delta conversion.

UNIT III RESONANCE AND COUPLED CIRCUITS 12

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

UNITIV TRANSIENT ANALYSIS 12

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

UNIT V TWO PORT NETWORKS 12

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

TOTAL : 60 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

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

SEMESTER II

20153S25B BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

L	T	P	C
3	0	0	3

OBJECTIVES:

To impart knowledge on

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

UNIT I AC CIRCUITS AND POWER SYSTEMS 9

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

UNIT II TRANSFORMER 9

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

UNIT III DC MACHINES 9

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

UNIT IV AC MACHINES 9

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

UNIT V MEASUREMENT AND INSTRUMENTATION 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

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

20152S26B ELECTRONIC DEVICES L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I SEMICONDUCTOR DIODE 9

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

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

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

UNIT III FIELD EFFECT TRANSISTORS 9

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

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

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

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

SEMESTER II

20154L27	**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:

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

Plumbing Works:

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

Carpentry using Power Tools only:

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

II MECHANICAL ENGINEERING PRACTICE 18

Welding:

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

Basic Machining:

Simple Turning and Taper turning
Drilling Practice

Sheet Metal Work:

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

Machine assembly practice:

Study of centrifugal pump
Study of air conditioner

Demonstration on:

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

GROUP B (ELECTRICAL & ELECTRONICS)

III ELECTRICAL ENGINEERING PRACTICE 13

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

IV ELECTRONICS ENGINEERING PRACTICE 16

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

SEMESTER II

20152L28B CIRCUITS AND DEVICES LABORATORY

20152L28B	**CIRCUITS AND DEVICES LABORATORY**	**L T P C**
		0 0 4 2

OBJECTIVES:

- To learn the characteristics of basic electronic devices such as Diode, BJT,FET, SCR
- To understand the working of RL,RC and RLC circuits
- To gain hand on experience in Thevinin & Norton theorem, KVL & KCL, and Super Position Theorems

1. Characteristics of PN Junction Diode
2. Zener diode Characteristics & Regulator using Zener diode
3. Common Emitter input-output Characteristics
4. Common Base input-output Characteristics
5. FET Characteristics
6. SCR Characteristics
7. Clipper and Clamper & FWR
8. Verifications Of Thevinin & Norton theorem
9. Verifications Of KVL & KCL
10. Verifications Of Super Position Theorem
11. verifications of maximum power transfer & reciprocity theorem
12. Determination Of Resonance Frequency of Series & Parallel RLC Circuits
13. Transient analysis of RL and RC circuits

TOTAL : 60 PERIODS

OUTCOMES:

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

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

SEMESTER II

201AGIC **INDIAN CONSTITUTION** **L T P C**
0 0 0 2

Aim:

- To understand the salient features of the Indian Constitution

Objectives:

- To make the students understand about the Democratic Rule and Parliamentarian 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.
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 III

20148S31B LINEAR ALGEBRA AND PARTIAL DIFFERENTIAL EQUATIONS

L	T	P	C
4	0	0	4

OBJECTIVES:

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

UNIT I VECTOR SPACES 12

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

UNIT II LINEAR TRANSFORMATION AND DIAGONALIZATION 12

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

UNIT III INNER PRODUCT SPACES 12

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

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 12

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

UNIT V FOURIER SERIES SOLUTIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

  Able to solve engineering problems using Fourier series.

TEXTBOOKS:

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

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

REFERENCES:

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

SEMESTER III

20152S32 CONTROL SYSTEMS ENGINEERING

	L	T	P	C
	3	0	0	3

OBJECTIVES:

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

UNIT I SYSTEMS COMPONENTS AND THEIR REPRESENTATION 9

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

UNIT II TIME RESPONSE ANALYSIS 9

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

UNIT III FREQUENCY RESPONSE AND SYSTEM ANALYSIS 9

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

UNIT IV CONCEPTS OF STABILITY ANALYSIS 9

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

UNIT V CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

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

TEXT BOOK:

1. M.Gopal, ―Control System – Principles and Design‖, Tata McGraw Hill, 4th Edition, 2012.

REFERENCES:

1. J.Nagrath and M.Gopal, ―Control System Engineering‖, New Age International Publishers, 5th Edition, 2007.
2. K. Ogata, 'Modern Control Engineering', 5th edition, PHI, 2012.

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

SEMESTER III

20152S33 FUNDAMENTALS OF DATA STRUCTURES IN C

L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I C PROGRAMMING BASICS 9

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

UNIT II FUNCTIONS, POINTERS, STRUCTURES AND UNIONS 9

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

UNIT III LINEAR DATA STRUCTURES 9

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

UNIT IV NON-LINEAR DATA STRUCTURES 9

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

UNIT V SEARCHING AND SORTING ALGORITHMS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

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

REFERENCES:

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

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

SEMESTER III

20152C34 DIGITAL ELECTRONICS

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I DIGITAL FUNDAMENTALS 9

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

UNIT II COMBINATIONAL CIRCUIT DESIGN 9

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

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9

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

UNIT V MEMORY DEVICES AND DIGITAL INTEGRATED CIRCUITS 9

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

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

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course:

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

TEXT BOOK:

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

REFERENCES:

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

SEMESTER III

20152C35 SIGNALS AND SYSTEMS

L	T	P	C
4	0	0	4

OBJECTIVES:

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

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 12

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

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS 12

Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and properties

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS 12

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

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS 12

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

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

TEXT BOOK:

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

REFERENCES

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

SEMESTER III

20152C36 ELECTRONIC CIRCUITS- I **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I BIASING OF DISCRETE BJT, JFET AND MOSFET 9

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

UNIT II BJT AMPLIFIERS 9

Small Signal Hybrid π equivalent circuit of BJT – Early effect - Analysis of CE, CC and CB amplifiers using Hybrid π equivalent circuits - AC Load Line Analysis- Darlington Amplifier - Bootstrap technique - Cascade, Cascode configurations - Differential amplifier, Basic BJT differential pair – Small signal analysis and CMRR.

UNIT III SINGLE STAGE FET, MOSFET AMPLIFIERS 9

Small Signal Hybrid π equivalent circuit of FET and MOSFET - Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits - Basic FET differential pair- BiCMOS circuits.

UNIT IV FREQUENCY RESPONSE OF AMPLIFIERS 9

Amplifier frequency response – Frequency response of transistor amplifiers with circuit capacitors – BJT frequency response – short circuit current gain - cut off frequency – f_α, f_β and unity gain bandwidth – Miller effect - frequency response of FET - High frequency analysis of CE and MOSFET CS amplifier - Transistor Switching Times.

UNIT V POWER SUPPLIES AND ELECTRONIC DEVICE TESTING 9

Linear mode power supply - Rectifiers - Filters - Half-Wave Rectifier Power Supply - Full-Wave Rectifier Power Supply - Voltage regulators: Voltage regulation - Linear series, shunt and switching Voltage Regulators - Over voltage protection - BJT and MOSFET – Switched mode power supply (SMPS) - Power Supply Performance and Testing - Troubleshooting and Fault Analysis, Design of Regulated DC Power Supply.

TOTAL: 45 PERIODS

OUTCOMES:

After studying this course, the student should be able to:

- Acquire knowledge of
  - Working principles, characteristics and applications of BJT and FET
  - Frequency response characteristics of BJT and FET amplifiers
- Analyze the performance of small signal BJT and FET amplifiers - single stage and multi stage amplifiers
- Apply the knowledge gained in the design of Electronic circuits

TEXT BOOKS:

1. Donald. A. Neamen, Electronic Circuits Analysis and Design, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010. (Unit I-IV)
2. Robert L. Boylestad and Louis Nasheresky, ―Electronic Devices and Circuit Theory‖, 11th Edition, Pearson Education, 2013. (Unit V)

REFERENCES

1. Millman J, Halkias.C.and Sathyabrada Jit, Electronic Devices and Circuits, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
2. Salivahanan and N. Suresh Kumar, Electronic Devices and Circuits, 4th Edition, , Mc Graw Hill Education (India) Private Ltd., 2017.
3. Floyd, Electronic Devices, Ninth Edition, Pearson Education, 2012.
4. David A. Bell, Electronic Devices & Circuits, 5th Edition, Oxford University Press, 2008.
5. Anwar A. Khan and Kanchan K. Dey, A First Course on Electronics, PHI, 2006.
6. Rashid M, Microelectronics Circuits, Thomson Learning, 2007.

SEMESTER III

20152L37 FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY

L T P C
0 0 4 2

OBJECTIVES:

- To understand and implement basic data structures using C
- To apply linear and non-linear data structures in problem solving.
- To learn to implement functions and recursive functions by means of data structures
- To implement searching and sorting algorithms

LIST OF EXERCISES

1. Basic C Programs – looping, data manipulations, arrays
2. Programs using strings – string function implementation
3. Programs using structures and pointers
4. Programs involving dynamic memory allocations
5. Array implementation of stacks and queues
6. Linked list implementation of stacks and queues
7. Application of Stacks and Queues
8. Implementation of Trees, Tree Traversals
9. Implementation of Binary Search trees
10. Implementation of Linear search and binary search
11. Implementation Insertion sort, Bubble sort, Quick sort and Merge Sort
12. Implementation Hash functions, collision resolution technique

TOTAL:60 PERIODS

OUTCOMES:

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

- Write basic and advanced programs in C
- Implement functions and recursive functions in C
- Implement data structures using C
- Choose appropriate sorting algorithm for an application and implement it in a modularized way

SEMESTER III

20152L38 ANALOG AND DIGITAL CIRCUITS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made to:

- Study the Frequency response of CE, CB and CC Amplifier
- Learn the frequency response of CS Amplifiers
- Study the Transfer characteristics of differential amplifier
- Perform experiment to obtain the bandwidth of single stage and multistage amplifiers
- Perform SPICE simulation of Electronic Circuits
- Design and implement the Combinational and sequential logic circuits

LIST OF ANALOG EXPERIMENTS:

1. Design of Regulated Power supplies
2. Frequency Response of CE, CB, CC and CS amplifiers
3. Darlington Amplifier
4. Differential Amplifiers - Transfer characteristics, CMRR Measurement
5. Cascode and Cascade amplifiers
6. Determination of bandwidth of single stage and multistage amplifiers
7. Analysis of BJT with Fixed bias and Voltage divider bias using Spice
8. Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software like Spice
9. Analysis of Cascode and Cascade amplifiers using Spice
10. Analysis of Frequency Response of BJT and FET using Spice

LIST OF DIGITAL EXPERIMENTS

1. Design and implementation of code converters using logic gates(i) BCD to excess-3 code and vice versa (ii) Binary to gray and vice-versa
2. Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483
3. Design and implementation of Multiplexer and De-multiplexer using logic gates
4. Design and implementation of encoder and decoder using logic gates
5. Construction and verification of 4 bit ripple counter and Mod-10 / Mod-12 Ripple counters
6. Design and implementation of 3-bit synchronous up/down counter

TOTAL : 60 PERIODS

OUTCOMES:

On completion of this laboratory course, the student should be able to:

- Design and Test rectifiers, filters and regulated power supplies.
- Design and Test BJT/JFET amplifiers.
- Differentiate cascode and cascade amplifiers.
- Analyze the limitation in bandwidth of single stage and multi stage amplifier
- Measure CMRR in differential amplifier
- Simulate and analyze amplifier circuits using PSpice.
- Design and Test the digital logic circuits.

SEMESTER III

20152L39 INTERPERSONAL SKILLS / LISTENING &SPEAKING

L	T	P	C
0	0	2	1

OBJECTIVES:

The Course will enable learners to:

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TOTAL : 30PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

SEMESTER III

201AGGS INTRODUCTION TO GENDER STUDIES

L	T	P	C
0	0	0	2

UNIT I CONCEPTS

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

UNIT II FEMINIST THEORY

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, eco-feminist.

UNIT III WOMEN'S MOVEMENTS: GLOBAL, NATIONAL AND LOCAL

Rise of Feminism in Europe and America.

Women's Movement in India.

UNIT IV GENDER AND LANGUAGE

Linguistic Forms and Gender.

Gender and narratives.

UNIT V GENDER AND REPRESENTATION

Advertising and popular visual media.

Gender and Representation in Alternative Media.

Gender and social media.

SEMESTER IV

20148S41B PROBABILITY AND RANDOM PROCESSES

L	T	P	C
4	0	0	4

OBJECTIVES :

- To provide necessary basic concepts in probability and random processes for applications such as random signals, linear systems in communication engineering.
- To understand the basic concepts of probability, one and two dimensional random variables and to introduce some standard distributions applicable to engineering which can describe real life phenomenon.
- To understand the basic concepts of random processes which are widely used in IT fields.
- To understand the concept of correlation and spectral densities.
- To understand the significance of linear systems with random inputs.

UNIT I PROBABILITY AND RANDOM VARIABLES 12

Probability – Axioms of probability – Conditional probability – Baye‘s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES 12

Classification – Stationary process – Markov process - Markov chain - Poisson process – Random telegraph process.

UNIT IV CORRELATION AND SPECTRAL DENSITIES 12

Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.

UNIT V LINEAR SYSTEMS WITH RANDOM INPUTS 12

Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.

TOTAL : 60 PERIODS

OUTCOMES:

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

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept random processes in engineering disciplines.
- Understand and apply the concept of correlation and spectral densities.
- The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.

TEXT BOOKS:

1. Ibe, O.C.," Fundamentals of Applied Probability and Random Processes ", 1st Indian Reprint, Elsevier, 2007.

2. Peebles, P.Z., "Probability, Random Variables and Random Signal Principles ", Tata McGraw Hill, 4th Edition, New Delhi, 2002.

REFERENCES:

1. Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", Oxford University Press, New Delhi, 3rd Indian Edition, 2012.
2. Hwei Hsu, "Schaum‘s Outline of Theory and Problems of Probability, Random Variables and Random Processes ", Tata McGraw Hill Edition, New Delhi, 2004.
3. Miller. S.L. and Childers. D.G., ― Probability and Random Processes with Applications to Signal Processing and Communications ", Academic Press, 2004.
4. Stark. H. and Woods. J.W., ― Probability and Random Processes with Applications to Signal Processing ", Pearson Education, Asia, 3rd Edition, 2002.
5. Yates. R.D. and Goodman. D.J., ―Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition, 2012.

SEMESTER IV

20152C42 ELECTRONIC CIRCUITS II

L	T	P	C
3	0	0	3

OBJECTIVES:

- To give a comprehensive exposure to all types of amplifiers and oscillators constructed with discrete components. This helps to develop a strong basis for building linear and digital integrated circuits
- To study about feedback amplifiers and oscillators principles
- To design oscillators.
- To study about turned amplifier.
- To understand the analysis and design of LC and RC oscillators, amplifiers, multi vibrators, power amplifiers and DC convertors.

UNIT I FEEDBACK AMPLIFIERS AND STABILITY 9

Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series - series, shunt-shunt and shunt-series feedback amplifiers-stability problem- Gain and Phase-margins- Frequency compensation.

UNIT II OSCILLATORS 9

Barkhausen criterion for oscillation – phase shift, Wien bridge - Hartley & Colpitt‘s oscillators – Clapp oscillator-Ring oscillators and crystal oscillators – oscillator amplitude stabilization.

UNIT III TUNED AMPLIFIERS 9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers – Analysis of capacitor coupled single tuned amplifier – double tuned amplifier - effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers - Stability of tuned amplifiers – Neutralization - Hazeltine neutralization method.

UNIT IV WAVE SHAPING AND MULTIVIBRATOR CIRCUITS 9

Pulse circuits – attenuators – RC integrator and differentiator circuits – diode clampers and clippers – Multivibrators - Schmitt Trigger- UJT Oscillator.

UNIT V POWER AMPLIFIERS AND DC CONVERTERS 9

Power amplifiers- class A-Class B-Class AB-Class C-Power MOSFET-Temperature Effect- Class AB Power amplifier using MOSFET –DC/DC convertors – Buck, Boost, Buck-Boost analysis and design

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Analyze different types of amplifier, oscillator and multivibrator circuits
- Design BJT amplifier and oscillator circuits
- Analyze transistorized amplifier and oscillator circuits
- Design and analyze feedback amplifiers
- Design LC and RC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, power amplifier and DC convertors.

TEXT BOOKS:

1. Sedra and Smith, ―Micro Electronic Circuits‖; Sixth Edition, Oxford University Press, 2011. (UNIT I, III,IV,V)
2. Jacob Millman, ‗Microelectronics‘, McGraw Hill, 2nd Edition, Reprinted, 2009. (UNIT I,II,IV,V)

REFERENCES:

1. Robert L. Boylestad and Louis Nasheresky, ―Electronic Devices and Circuit Theory‖, 10th Edition, Pearson Education / PHI, 2008
2. David A. Bell, ―Electronic Devices and Circuits‖, Fifth Edition, Oxford University Press, 2008.
3. Millman J. and Taub H., ―Pulse Digital and Switching Waveforms‖, TMH, 2000.
4. Millman and Halkias. C., Integrated Electronics, TMH, 2007.

SEMESTER IV

20152C43 COMMUNICATION THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce the concepts of various analog modulations and their spectral characteristics
- To understand the properties of random process
- To know the effect of noise on communication systems
- To study the limits set by Information Theory

UNIT I AMPLITUDE MODULATION 9

Amplitude Modulation- DSBSC, DSBFC, SSB, VSB - Modulation index, Spectra, Power relations and Bandwidth – AM Generation – Square law and Switching modulator, DSBSC Generation – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Pre-envelope & complex envelope –comparison of different AM techniques, Superheterodyne Receiver

UNIT II ANGLE MODULATION 9

Phase and frequency modulation, Narrow Band and Wide band FM – Modulation index, Spectra, Power relations and Transmission Bandwidth - FM modulation –Direct and Indirect methods, FM Demodulation – FM to AM conversion, FM Discriminator - PLL as FM Demodulator.

UNIT III RANDOM PROCESS 9

Random variables, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random Process Through a LTI filter.

UNIT IV NOISE CHARACTERIZATION 9

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise –In-phase and quadrature, Envelope and Phase – Noise performance analysis in AM & FM systems – Threshold effect, Pre-emphasis and de-emphasis for FM.

UNIT V SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding –PAM, PPM, PWM, PCM – TDM, FDM.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Design AM communication systems
- Design Angle modulated communication systems
- Apply the concepts of Random Process to the design of Communication systems
- Analyze the noise performance of AM and FM systems
- Gain knowledge in sampling and quantization

TEXT BOOKS:

1. J.G.Proakis, M.Salehi, ―Fundamentals of Communication Systems‖, Pearson Education 2014. (UNIT I-IV)
2. Simon Haykin, ―Communication Systems‖, 4th Edition, Wiley, 2014.(UNIT I-V)

REFERENCES:

1. B.P.Lathi, ―Modern Digital and Analog Communication Systems‖, 3rd Edition, Oxford University Press, 2007.

2. D.Roody, J.Coolen, ―Electronic Communications, 4th edition PHI 2006
3. A.Papoulis, ―Probability, Random variables and Stochastic Processes‖, McGraw Hill, 3rd edition, 1991.
4. B.Sklar, ―Digital Communications Fundamentals and Applications‖, 2nd Edition Pearson Education 2007
5. H P Hsu, Schaum Outline Series - ―Analog and Digital Communications‖ TMH 2006
6. Couch.L., "Modern Communication Systems", Pearson, 2001.

SEMESTER IV

20152C44 ELECTROMAGNETIC FIELDS

L T P C	
4 0 0 4	

OBJECTIVES:

- To gain conceptual and basic mathematical understanding of electric and magnetic fields in free space and in materials
- To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations
- To understand wave propagation in lossless and in lossy media
- To be able to solve problems based on the above concepts

UNIT I INTRODUCTION 12

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems, Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem, Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem

UNIT II ELECTROSTATICS 12

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions, Current density and Ohm's law, Electromotive force and Kirchhoff's voltage law, Equation of continuity and Kirchhoff's current law

UNIT III MAGNETOSTATICS 12

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torques

UNIT IV TIME-VARYING FIELDS AND MAXWELL's EQUATIONS 12

Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields

UNIT V PLANE ELECTROMAGNETIC WAVES 12

Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary

TOTAL: 60 PERIODS

OUTCOMES:

By the end of this course, the student should be able to:

- Display an understanding of fundamental electromagnetic laws and concepts
- Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning
- Explain electromagnetic wave propagation in lossy and in lossless media
- Solve simple problems requiring estimation of electric and magnetic field quantities based on these concepts and laws

TEXT BOOKS:

1. D.K. Cheng, Field and wave electromagnetics, 2nd ed., Pearson (India), 1989 (UNIT I, II,III IV,V)

2. W.H. Hayt and J.A. Buck, Engineering electrmagnetics, 7th ed., McGraw-Hill (India), 2006 (UNIT I-V)

REFERENCES

1. D.J. Griffiths, Introduction to electrodynamics, 4th ed., Pearson (India), 2013
2. B.M. Notaros, Electromagnetics, Pearson: New Jersey, 2011
3. M.N.O. Sadiku and S.V. Kulkarni, Principles of electromagnetics, 6th ed., Oxford (Asian Edition), 2015

SEMESTER IV

20152C45 LINEAR INTEGRATED CIRCUITS **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the basic building blocks of linear integrated circuits
- To learn the linear and non-linear applications of operational amplifiers
- To introduce the theory and applications of analog multipliers and PLL
- To learn the theory of ADC and DAC
- To introduce the concepts of waveform generation and introduce some special function ICs

UNIT I BASICS OF OPERATIONAL AMPLIFIERS 9

Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages -and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – JFET Operational Amplifiers – LF155 and TL082.

UNIT II APPLICATIONS OF OPERATIONAL AMPLIFIERS 9

Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.

UNIT III ANALOG MULTIPLIER AND PLL 9

Analog Multiplier using Emitter Coupled Transistor Pair - Gilbert Multiplier cell – Variable transconductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronisation.

UNIT IV ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS 9

Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current-Mode *R - 2R* Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type - A/D Converter using Voltage-to-Time Conversion - Over-sampling A/D Converters, Sigma – Delta converters.

UNIT V WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS 9

Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Monolithic switching regulator, Low Drop – Out(LDO) Regulators - Switched capacitor filter IC MF10, Frequency to Voltage and Voltage to Frequency converters, Audio Power amplifier, Video Amplifier, Isolation Amplifier, Opto-couplers and fibre optic IC.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Design linear and non linear applications of OP – AMPS
- Design applications using analog multiplier and PLL
- Design ADC and DAC using OP – AMPS
- Generate waveforms using OP – AMP Circuits
- Analyze special function ICs

TEXT BOOKS:

1. D.Roy Choudhry, Shail Jain, ―Linear Integrated Circuits‖, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2. Sergio Franco, ―Design with Operational Amplifiers and Analog Integrated Circuits‖, 4th Edition, Tata Mc Graw-Hill, 2016 (Unit I – V)

REFERENCES:

1. Ramakant A. Gayakwad, ―OP-AMP and Linear ICs‖, 4th Edition, Prentice Hall / Pearson Education, 2015.
2. Robert F.Coughlin, Frederick F.Driscoll, ―Operational Amplifiers and Linear Integrated Circuits‖, Sixth Edition, PHI, 2001.
3. B.S.Sonde, ―System design using Integrated Circuits‖ , 2nd Edition, New Age Pub, 2001.
4. Gray and Meyer, ―Analysis and Design of Analog Integrated Circuits‖, Wiley International,5th Edition, 2009.
5. William D.Stanley, ―Operational Amplifiers with Linear Integrated Circuits‖, Pearson Education,4th Edition,2001.
6. S.Salivahanan & V.S. Kanchana Bhaskaran, ―Linear Integrated Circuits‖, TMH,2nd Edition, 4th Reprint, 2016.

SEMESTER IV

20149S46 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.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, ‗Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, ‗Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, ‗Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
2. Erach Bharucha, ―Textbook of Environmental Studies‖, Universities Press(I) PVT, LTD, Hydrabad, 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.

SEMESTER IV

20152L47 CIRCUITS DESIGN AND SIMULATION LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To gain hands on experience in designing electronic circuits
- To learn simulation software used in circuit design
- To learn the fundamental principles of amplifier circuits
- To differentiate feedback amplifiers and oscillators.
- To differentiate the operation of various multivibrators

DESIGN AND ANALYSIS OF THE FOLLOWING CIRCUITS

1. Series and Shunt feedback amplifiers-Frequency response, Input and output impedance
2. RC Phase shift oscillator and Wien Bridge Oscillator
3. Hartley Oscillator and Colpitts Oscillator
4. Single Tuned Amplifier
5. RC Integrator and Differentiator circuits
6. Astable and Monostable multivibrators
7. Clippers and Clampers

SIMULATION USING SPICE (Using Transistor):

1. Tuned Collector Oscillator
2. Twin -T Oscillator / Wein Bridge Oscillator
3. Double and Stagger tuned Amplifiers
4. Bistable Multivibrator
5. Schmitt Trigger circuit with Predictable hysteresis
6. Analysis of power amplifier

TOTAL: 60 PERIODS

OUTCOMES:

On completion of this laboratory course, the student should be able to:

- Analyze various types of feedback amplifiers
- Design oscillators, tuned amplifiers, wave-shaping circuits and multivibrators
- Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.

SEMESTER IV

20152L48 LINEAR INTEGRATED CIRCUITS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To understand the basics of linear integrated circuits and available ICs
- To understand the characteristics of the operational amplifier.
- To apply operational amplifiers in linear and nonlinear applications.
- To acquire the basic knowledge of special function IC.
- To use SPICE software for circuit design

DESIGN AND TESTING OF THE FOLLOWING CIRCUITS

1. Inverting, Non inverting and differential amplifiers.
2. Integrator and Differentiator.
3. Instrumentation amplifier
4. Active low-pass, High-pass and band-pass filters.
5. Astable & Monostable multivibrators using Op-amp
6. Schmitt Trigger using op-amp.
7. Phase shift and Wien bridge oscillators using Op-amp.
8. Astable and Monostable multivibrators using NE555 Timer.
9. PLL characteristics and its use as Frequency Multiplier, Clock synchronization
10. R-2R Ladder Type D- A Converter using Op-amp.
11. DC power supply using LM317 and LM723.
12. Study of SMPS

SIMULATION USING SPICE:

1. Active low-pass, High-pass and band-pass filters using Op-amp
2. Astable and Monostable multivibrators using NE555 Timer.
3. A/ D converter
4. Analog multiplier

TOTAL: 60 PERIODS

OUTCOMES:

On completion of this laboratory course, the student should be able to:

- Design amplifiers, oscillators, D-A converters using operational amplifiers.
- Design filters using op-amp and performs an experiment on frequency response.
- Analyze the working of PLL and describe its application as a frequency multiplier.
- Design DC power supply using ICs.
- Analyze the performance of filters, multivibrators, A/D converter and analog multiplier using SPICE.

SEMESTER IV

201AGCE	COMMUNITY ENGAGEMENT	L T P C 0 0 0 2

OBJECTIVES:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

LEARNING OUTCOMES:
After completing this course, student will be able to:

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

Credit

2 credit, 30 hours, at least 50% in field, compulsory for all students

Contents

Divided into four Modules, field immersion is part of each Unit
Course Structure: 2 Credits Course (1 Credit for Classroom and Tutorials and 1 Credit for Field Engagement)

S. No.	Module Title	Module Content	Assignment	ching/ Learning Methodology	No. of Classes
1	**Appreciation of Rural Society**	Rural lifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of"soul of India lies in villages' (Gandhi), rural infrastructure	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	- Classroom discussions - Field visit** - Assignment Map	2 4 2

2	***Understanding rural economy & livelihood***	Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Describe your analysis of rural household economy, its llenges and possible pathways to address them	- Field visit** - Group discussions in class - Assignment	3 4 1
3	***Rural Institutions***	Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration	How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	- Classroom - Field visit** - Group presentation of assignment	2 4 2
4	***Rural Development Programmes***	Hi story of rural development India, current national programmes: Sarva Shiksha Abhiyan, ti Bachao, Beti Padhao, ıshman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	scribe the benefits received and challenges ed in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	- Classroom - Each student selects one program for field visit** - Written assignment	2 4 2

SEMESTER V

20152C51 DIGITAL COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the principles of sampling & quantization
- To study the various waveform coding schemes
- To learn the various baseband transmission schemes
- To understand the various band pass signaling schemes
- To know the fundamentals of channel coding

UNIT I INFORMATION THEORY 9

Discrete Memoryless source, Information, Entropy, Mutual Information - Discrete Memoryless channels – Binary Symmetric Channel, Channel Capacity - Hartley - Shannon law - Source coding theorem - Shannon - Fano & Huffman codes.

UNIT II WAVEFORM CODING & REPRESENTATION 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding- Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester

UNIT III BASEBAND TRANSMISSION & RECEPTION 9

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding - Eye pattern – Receiving Filters- Matched Filter, Correlation receiver, Adaptive Equalization

UNIT IV DIGITAL MODULATION SCHEME 9

Geometric Representation of signals - Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers - Principle of DPSK.

UNIT V ERROR CONTROL CODING 9

Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes - Convolutional codes - Viterbi Decoder.

TOTAL:45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to

- Design PCM systems
- Design and implement base band transmission schemes
- Design and implement band pass signaling schemes
- Analyze the spectral characteristics of band pass signaling schemes and their noise performance
- Design error control coding schemes

TEXT BOOK:

1. S. Haykin, ―Digital Communications‖, John Wiley, 2005 (Unit I –V)

REFERENCES

1. B. Sklar, ―Digital Communication Fundamentals and Applications‖, 2nd Edition, Pearson Education, 2009
2. B.P.Lathi, ―Modern Digital and Analog Communication Systems‖ 3rd Edition, Oxford University Press 2007.
3. H P Hsu, Schaum Outline Series - ―Analog and Digital Communications‖, TMH 2006
4. J.G Proakis, ―Digital Communication‖, 4th Edition, Tata Mc Graw Hill Company, 2001.

SEMESTER V

20152C52 DISCRETE-TIME SIGNAL PROCESSING

	L	T	P	C
	4	0	0	4

OBJECTIVES:

- To learn discrete fourier transform, properties of DFT and its application to linear filtering
- To understand the characteristics of digital filters, design digital IIR and FIR filters and apply these filters to filter undesirable signals in various frequency bands
- To understand the effects of finite precision representation on digital filters
- To understand the fundamental concepts of multi rate signal processing and its applications
- To introduce the concepts of adaptive filters and its application to communication engineering

UNIT I DISCRETE FOURIER TRANSFORM 12

Review of signals and systems, concept of frequency in discrete-time signals, summary of analysis & synthesis equations for FT & DTFT, frequency domain sampling, Discrete Fourier transform (DFT) - deriving DFT from DTFT, properties of DFT - periodicity, symmetry, circular convolution. Linear filtering using DFT. Filtering long data sequences - overlap save and overlap add method. Fast computation of DFT - Radix-2 Decimation-in-time (DIT) Fast Fourier transform (FFT), Decimation-in-frequency (DIF) Fast Fourier transform (FFT). Linear filtering using FFT.

UNIT II INFINITE IMPULSE RESPONSE FILTERS 12

Characteristics of practical frequency selective filters. characteristics of commonly used analog filters - Butterworth filters, Chebyshev filters. Design of IIR filters from analog filters (LPF, HPF, BPF, BRF) - Approximation of derivatives, Impulse invariance method, Bilinear transformation. Frequency transformation in the analog domain. Structure of IIR filter - direct form I, direct form II, Cascade, parallel realizations.

UNIT III FINITE IMPULSE RESPONSE FILTERS 12

Design of FIR filters - symmetric and Anti-symmetric FIR filters - design of linear phase FIR filters using Fourier series method - FIR filter design using windows (Rectangular, Hamming and Hanning window), Frequency sampling method. FIR filter structures - linear phase structure, direct form realizations

UNIT IV FINITE WORD LENGTH EFFECTS 12

Fixed point and floating point number representation - ADC - quantization - truncation and rounding - quantization noise - input / output quantization - coefficient quantization error - product quantization error - overflow error - limit cycle oscillations due to product quantization and summation - scaling to prevent overflow.

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS 12

DSP functionalities - circular buffering – DSP architecture – Fixed and Floating point architecture principles – Programming – Application examples.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Apply DFT for the analysis of digital signals and systems
- Design IIR and FIR filters
- Characterize the effects of finite precision representation on digital filters
- Design multirate filters
- Apply adaptive filters appropriately in communication systems

TEXT BOOK:

1. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007. (UNIT I – V)

REFERENCES:

1. Emmanuel C. Ifeachor & Barrie. W. Jervis, ―Digital Signal Processing‖, Second Edition, Pearson Education / Prentice Hall, 2002.
2. A. V. Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing‖, 8th Indian Reprint, Pearson, 2004.
3. Sanjit K. Mitra, ―Digital Signal Processing – A Computer Based Approach‖, Tata Mc Graw Hill, 2007.
4. Andreas Antoniou, ―Digital Signal Processing‖, Tata Mc Graw Hill, 2006.

SEMESTER V

20152S53 COMPUTER ARCHITECTURE AND ORGANIZATION

L T P C
3 0 0 3

OBJECTIVES:

- To make students understand the basic structure and operation of digital computer
- To familiarize with implementation of fixed point and floating-point arithmetic operations
- To study the design of data path unit and control unit for processor
- To understand the concept of various memories and interfacing
- To introduce the parallel processing technique

UNIT I COMPUTER ORGANIZATION & INSTRUCTIONS 9

Basics of a computer system: Evolution, Ideas, Technology, Performance, Power wall, Uniprocessors to Multiprocessors. Addressing and addressing modes. Instructions: Operations and Operands, Representing instructions, Logical operations, control operations.

UNIT II ARITHMETIC 9

Fixed point Addition, Subtraction, Multiplication and Division. Floating Point arithmetic, High performance arithmetic, Subword parallelism

UNIT III THE PROCESSOR 9

Introduction, Logic Design Conventions, Building a Datapath - A Simple Implementation scheme - An Overview of Pipelining - Pipelined Datapath and Control. Data Hazards: Forwarding versus Stalling, Control Hazards, Exceptions, Parallelism via Instructions.

UNIT IV MEMORY AND I/O ORGANIZATION 9

Memory hierarchy, Memory Chip Organization, Cache memory, Virtual memory. Parallel Bus Architectures, Internal Communication Methodologies, Serial Bus Architectures, Mass storage, Input and Output Devices.

UNIT V ADVANCED COMPUTER ARCHITECTURE 9

Parallel processing architectures and challenges, Hardware multithreading, Multicore and shared memory multiprocessors, Introduction to Graphics Processing Units, Clusters and Warehouse scale computers - Introduction to Multiprocessor network topologies.

TOTAL:45 PERIODS

OUTCOMES:

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

- Describe data representation, instruction formats and the operation of a digital computer
- Illustrate the fixed point and floating-point arithmetic for ALU operation
- Discuss about implementation schemes of control unit and pipeline performance
- Explain the concept of various memories, interfacing and organization of multiple processors
- Discuss parallel processing technique and unconventional architectures

TEXT BOOKS:

1. David A. Patterson and John L. Hennessey, ―Computer Organization and Design‖, Fifth Edition, Morgan Kauffman / Elsevier, 2014. (UNIT I-V)
2. Miles J. Murdocca and Vincent P. Heuring, ―Computer Architecture and Organization: An Integrated approach‖, Second edition, Wiley India Pvt Ltd, 2015 (UNIT IV,V)

REFERENCES

1. V. Carl Hamacher, Zvonko G. Varanesic and Safat G. Zaky, ―Computer Organization―, Fifth edition, Mc Graw-Hill Education India Pvt Ltd, 2014.

2. William Stallings ―Computer Organization and Architecture‖, Seventh Edition, Pearson Education, 2006.
3. Govindarajalu, ―Computer Architecture and Organization, Design Principles and Applications", Second edition, McGraw-Hill Education India Pvt Ltd, 2014.

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – I (SEMESTER V)

OPEN ELECTIVE – I
SEMESTER V

20150OE54A	**DATABASE MANAGEMENT SYSTEMS**	**L T P C**
		3 0 0 3

OBJECTIVES:

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

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

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

UNIT II DATABASE QUERYING 11

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

UNIT III DATABASE PROGRAMMING 7

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

UNIT IV DATABASE DESIGN 9

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

UNIT V ADVANCED TOPICS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson, 2011.
2. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.

20150OE54B CLOUD COMPUTING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION TO CLOUD COMPUTING 9
Introduction to Cloud Computing – Roots of Cloud Computing – Desired Features of Cloud Computing – Challenges and Risks – Benefits and Disadvantages of Cloud Computing.

UNIT II VIRTUALIZATION 9
Introduction to Virtualization Technology – Load Balancing and Virtualization – Understanding Hypervisor – Seven Layers of Virtualization – Types of Virtualization – Server, Desktop, Application Virtualization.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9
NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9
Inter Cloud Resource Management – Resource Provisioning Methods – Security Overview – Cloud Security Challenges – Data Security –Application Security – Virtual Machine Security.

UNIT V CASE STUDIES 9
Google App Engine(GAE) – GAE Architecture – Functional Modules of GAE – Amazon Web Services(AWS) – GAE Applications – Cloud Software Environments – Eucalyptus – Open Nebula – Open Stack.

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:

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

TEXT BOOKS:

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

REFERENCES:

1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, “Mastering Cloud Computing”, Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)”, O'Reilly, 2009.

OPEN ELECTIVE – I
SEMESTER V

20153OE54A **INDUSTRIAL NANO TECHNOLOGY** **L T P C**
3 0 0 3

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

UNIT I NANO ELECTRONICS 9
Advantages of nano electrical and electronic devices –Electronic circuit chips – Lasers - Micro and NanoElectromechanical systems – Sensors, Actuators, Optical switches,- Data memory –Lighting and Displays – Batteries - Fuel cells and Photo-voltaic cells – Electric double layer capacitors – Lead-free solder – Nanoparticle coatings for electrical products.

UNIT II BIONANOTECHNOLOGY 9
Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery – Nanosensors in Diagnosis– Neuro-electronic Interfaces– Therapeutic applications.

UNIT III NANOTECHNOLOGY IN CHEMICAL INDUSTRY 9
Nanocatalyts – Smart materials – Heterogenous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors.

UNIT IV NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY 9
Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry.

UNIT V NANOTECHNOLOGY IN TEXTILES AND COSMETICS 9
Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application– Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair-conditioners.

TOTAL: 45 PERIODS

REFERENCES:

1. Neelina H. Malsch (Ed.),Biomedical Nanotechnology, CRC Press (2005)
2. Udo H. Brinker, Jean-Luc Mieusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems,Wiley Publishers (2010).
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).
4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai,Polymer Nano composites, Woodhead publishing, (2006).
7. W.N. Chang,Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

OPEN ELECTIVE – I
SEMESTER V

20153OE54B ENERGY CONSERVATION AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:
At the end of the course, the student is expected to

- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

UNIT I INTRODUCTION 9
Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS 9
Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 9
Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9
Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS 9
Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carry out energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

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

OPEN ELECTIVE – I
SEMESTER V

20154OE54A 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 titled 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:

- Understanding the physics of solar radiation.
- Ability to classify the solar energy collectors and methodologies of storing solar energy.
- Knowledge in applying solar energy in a useful way.
- Knowledge in wind energy and biomass with its economic aspects.
- Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.

TEXT BOOKS:

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

REFERENCES:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007

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

OPEN ELECTIVE – I
SEMESTER V

20154OE54B AUTOMOTIVE SYSTEMS

L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

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

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

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

UNIT III TRANSMISSION SYSTEMS 9

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

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

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

UNIT V ALTERNATIVE ENERGY SOURCES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- identify the different components in automobile engineering.
- have clear understanding on different auxiliary and transmission systems usual.

TEXT BOOKS:

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

REFERENCES:

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

OPEN ELECTIVE – I
SEMESTER V

20155OE54A AIR POLLUTION AND CONTROL ENGINEERING L T P C
3 0 0 3

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

UNIT I INTRODUCTION 7
Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6
Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11
Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11
Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10
Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:
The students completing the course will have
- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:

1. 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.

OPEN ELECTIVE – I
SEMESTER V

20155OE54B GEOGRAPHIC INFORMATION SYSTEM **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF GIS 9
Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS 9
Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models- TIN and GRID data models - OGC standards - Data Quality.

UNIT III DATA INPUT AND TOPOLOGY 9
Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser –Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping.

UNIT IV DATA ANALYSIS 9
Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V APPLICATIONS 9
GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL: 45 PERIODS

OUTCOMES:
This course equips the student to

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

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, “An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCE:

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

SEMESTER V

20152C55 COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the division of network functionalities into layers.
- Be familiar with the components required to build different types of networks
- Be exposed to the required functionality at each layer
- Learn the flow control and congestion control algorithms

UNIT I FUNDAMENTALS & LINK LAYER 9

Overview of Data Communications- Networks – Building Network and its types– Overview of Internet - Protocol Layering - OSI Mode – Physical Layer – Overview of Data and Signals - introduction to Data Link Layer - Link layer Addressing- Error Detection and Correction

UNIT II MEDIA ACCESS & INTERNETWORKING 9

Overview of Data link Control and Media access control - Ethernet (802.3) - Wireless LANs – Available Protocols – Bluetooth – Bluetooth Low Energy – WiFi – 6LowPAN–Zigbee - Network layer services – Packet Switching – IPV4 Address – Network layer protocols (IP, ICMP, Mobile IP)

UNIT III ROUTING 9

Routing - Unicast Routing – Algorithms – Protocols – Multicast Routing and its basics – Overview of Intradomain and interdomain protocols – Overview of IPv6 Addressing – Transition from IPv4 to IPv6

UNIT IV TRANSPORT LAYER 9

Introduction to Transport layer –Protocols- User Datagram Protocols (UDP) and Transmission Control Protocols (TCP) –Services – Features – TCP Connection – State Transition Diagram – Flow, Error and Congestion Control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

UNIT V APPLICATION LAYER 9

Application Layer Paradigms – Client Server Programming – World Wide Web and HTTP - DNS- - Electronic Mail (SMTP, POP3, IMAP, MIME) – Introduction to Peer to Peer Networks – Need for Cryptography and Network Security – Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the components required to build different types of networks
- Choose the required functionality at each layer for given application
- Identify solution for each functionality at each layer
- Trace the flow of information from one node to another node in the network

TEXT BOOK:

1. Behrouz A. Forouzan, ―Data communication and Networking‖, Fifth Edition, Tata McGraw –Hill, 2013 (UNIT I –V)

REFERENCES

1. James F. Kurose, Keith W. Ross, ―Computer Networking - A Top-Down Approach Featuring the Internet‖, Seventh Edition, Pearson Education, 2016.
2. Nader. F. Mir,― Computer and Communication Networks‖, Pearson Prentice Hall Publishers, 2nd Edition, 2014.

3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, ―Computer Networks: An Open Source Approach‖, Mc Graw Hill Publisher, 2011.
4. Larry L. Peterson, Bruce S. Davie, ―Computer Networks: A Systems Approach‖, Fifth Edition, Morgan Kaufmann Publishers, 2011.

LIST OF ELECTIVES

ELECTIVE – I (SEMESTER V)

ELECTIVE – I
SEMESTER V

20152E56A OBJECT ORIENTED PROGRAMMING **L T P C**
3 0 0 3

OBJECTIVES:

- To understand Object Oriented Programming concepts and basic characteristics of Java
- To know the principles of packages, inheritance and interfaces
- To define exceptions and use I/O streams
- To develop a java application with threads and generics classes
- To design and build simple Graphical User Interfaces

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment - Java Source File - Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II INHERITANCE AND INTERFACES 9

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, Array Lists - Strings

UNIT III EXCEPTION HANDLING AND I/O 9

Exceptions - exception hierarchy - throwing and catching exceptions - built in exceptions, creating own exception, Stack Trace Elements.

Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files

UNIT IV MULTITHREADING AND GENERIC PROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter thread communication, daemon threads, thread groups.

Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V EVENT DRIVEN PROGRAMMING 9

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces

- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

TEXT BOOKS:

1. Herbert Schildt, ―Java The complete reference‖, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.
2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.
3. Timothy Budd, ―Understanding Object-oriented programming with Java‖, Updated Edition, Pearson Education, 2000.

ELECTIVE – I
SEMESTER V

20152E56B MEDICAL ELECTRONICS **L T P C**
3 0 0 3

OBJECTIVES:
The student should be made:

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters
- To study about the various assist devices used in the hospitals
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9
Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9
pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES 9
Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging Systems, Ultrasonic Imaging Systems.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9
Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9
Telemedicine, Insulin Pumps, Radio pill, Endomicroscopy, Brain machine interface, Lab on a chip.

TOTAL: 45 PERIODS

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

- Know the human body electro- physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

TEXT BOOK:

1. Leslie Cromwell, ―Biomedical Instrumentation and Measurement‖, Prentice Hall of India, New Delhi, 2007. (UNIT I – V)

REFERENCES:

1. Khandpur, R.S., ―Handbook of Biomedical Instrumentation‖, TATA Mc Graw-Hill, New Delhi, 2003.
2. John G.Webster, ―Medical Instrumentation Application and Design‖, 3rd Edition, Wiley India Edition, 2007
3. Joseph J.Carr and John M.Brown, ―Introduction to Biomedical Equipment Technology‖, John Wiley and Sons, New York, 2004.

ELECTIVE – I
SEMESTER V

20152E56C OPERATING SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I OPERATING SYSTEM OVERVIEW 7

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock – System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT 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, Interprocess Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.

- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers and compare iOS and Android Operating Systems.

TEXT BOOK :

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES :

1. Ramaz Elmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach‖, Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, ― Operating Systems‖, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Pearson Education, 2004.
4. Gary Nutt, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
5. Harvey M. Deital, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel‖, 3rd edition, O'Reilly, 2005.
7. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode‖, Fourth Edition, Payload media, 2011.

ELECTIVE – I
SEMESTER V

20152E56D ROBOTICS AND AUTOMATION L T P C
3 0 0 3

OBJECTIVES:
The student should be made:
- To understand the basic concepts associated with the design, functioning, applications and social aspects of robots
- To study about the electrical drive systems and sensors used in robotics for various applications
- To learn about analyzing robot kinematics, dynamics through different methodologies and study various design aspects of robot arm manipulator and end-effector
- To learn about various motion planning techniques and the associated control architecture
- To understand the implications of AI and other trending concepts of robotics

UNIT I FOUNDATION FOR BEGINNERS 9
Introduction -- brief history, definition, anatomy, types, classification, specification and need based applications; role and need of robots for the immediate problems of the society, future of mankind and automation-ethical issues; industrial scenario local and global, case studies on mobile robot research platform and industrial serial arm manipulator

UNIT II BUILDING BLOCKS OF A ROBOT 9
Types of electric motors - DC, Servo, Stepper; specification, drives for motors - speed & direction control and circuitry, Selection criterion for actuators, direct drives, non-traditional actuators; Sensors for localization, navigation, obstacle avoidance and path planning in known and unknown environments – optical, inertial, thermal, chemical, biosensor, other common sensors; Case study on choice of sensors and actuators for maze solving robot and self driving cars

UNIT III KINEMATICS, DYNAMICS AND DESIGN OF ROBOTS & END-EFFECTORS 9
Robot kinematics - Geometric approach for 2R, 3R manipulators, homogenous transformation using D-H representation, kinematics of WMR, Lagrangian formulation for 2R robot dynamics; Mechanical design aspects of a 2R manipulator, WMR; End-effector - common types and design case study.

UNIT IV NAVIGATION, PATH PLANNING AND CONTROL ARCHITECTURE 9
Mapping & Navigation – SLAM, Path planning for serial manipulators; types of control architectures - Cartesian control, Force control and hybrid position/force control, Behaviour based control, application of Neural network, fuzzy logic, optimization algorithms for navigation problems, programming methodologies of a robot

UNIT V AI AND OTHER RESEARCH TRENDS IN ROBOTICS 9
Application of Machine learning - AI, Expert systems; Tele-robotics and Virtual Reality, Micro & Nanorobots, Unmanned vehicles, Cognitive robotics, Evolutionary robotics, Humanoids

TOTAL: 45 PERIODS

OUTCOMES:
The student should be able to:
- Explain the concepts of industrial robots in terms of classification, specifications and coordinate systems, along with the need and application of robots & automation
- Examine different sensors and actuators for applications like maze solving and self driving cars.
- Design a 2R robot & an end-effector and solve the kinematics and dynamics of motion for robots.
- Explain navigation and path planning techniques along with the control architectures adopted for robot motion planning.
- Describe the impact and progress in AI and other research trends in the field of robotics.

TEXT BOOKS:

1. Saeed. B. Niku, Introduction to Robotics, Analysis, system, Applications, Pearson Educations, 2002
2. Roland Siegwart, Illah Reza Nourbakhsh, Introduction to Autonomous Mobile Robots, MIT Press, 2011

REFERENCES:

1. Richard David Klafter, Thomas A. Chmielewski, Michael Negin, Robotic engineering: an integrated approach, Prentice Hall, 1989
2. Craig, J. J., Introduction to Robotics: Mechanics and Control, 2nd Edition, Addison-Wesley, 1989.
3. K.S. Fu, R.C. Gonzalez and C.S.G. Lee, Robotics: Control, Sensing, Vision and Intelligence, McGraw-Hill, 1987.
4. Wesley E Snyder R, Industrial Robots, Computer Interfacing and Control, Prentice Hall International Edition, 1988.
5. Robin Murphy, Introduction to AI Robotics, MIT Press, 2000
6. Ronald C. Arkin, Behavior-based Robotics, MIT Press, 1998
7. N. P. Padhy, Artificial Intelligence and Intelligent Systems, Oxford University Press, 2005
8. Stefano Nolfi, Dario Floreano, Evolutionary Robotics – The Biology, Intelligence and Technology of Self–Organizing Machines (Intelligent Robotics and Autonomous Agents series), MIT Press, 2004.

ELECTIVE – I
SEMESTER V

20152E56E NANO TECHNOLOGY AND APPLICATIONS L T P C
3 0 0 3

OBJECTIVES:

- To provide a broad view of the nascent field of nanoscience and nanotechnology to undergraduates
- To explore the basics of nanomaterial synthesis and characterization.
- To introduce the applications of nanotechnology

UNIT I INTRODUCTION TO NANOTECHNOLOGY 9
Basic Structure of Nanoparticles- Kinetics in Nanostructured Materials- Zero dimensional, size and shape of nanoparticles; one-dimensional and two dimensional nanostructures- clusters of metals and semiconductors, bio nano-particles.

UNIT II FABRICATION AND CHARACTERIZATION OF NANOMATERIALS 9
Types of Nanomaterials (Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Buckyballs, Nanotubes); Gas, liquid, and solid –phase synthesis of nanomaterials; Lithography techniques (Photolithography, Dip-pen and Electron beam lithography); Thin film deposition; Electrospinning. Bio-synthesis of nanomaterials.

UNIT III PROPERTIES AND MEASUREMENT OF NANOMATERIALS 9
Optical Properties: Absorption, Fluorescence, and Resonance; Methods for the measurement of nanomaterials; Microscopy measurements: SEM, TEM, AFM and STM. Confocal and TIRF imaging.

UNIT IV NANO STRUCTURES 9
Carbon Nanotubes, Fullerenes, Nanowires, Quantum Dots. Applications of nanostructures. Reinforcement in Ceramics, Drug delivery, Giant magnetoresistance, etc. Cells response to Nanostructures.

UNIT V APPLICATIONS OF NANOTECHNOLOGY 9
Nano electronics, Nano sensors, Nanotechnology in Diagnostics applications, Environmental and Agricultural Applications of nanotechnology, Nano technology for energy systems

TOTAL: 45 PERIODS

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

- Describe the basic science behind the properties of materials.
- Interpret the creation, characterization, and manipulation of nanoscale materials.
- Comprehend the exciting applications of nanotechnology at the leading edge of scientific research
- Apply their knowledge of nanotechnology to identify how they can be exploited for new applications.

TEXT BOOKS:

1. Springer Handbook of Nanotechnology by Bharat Bhushan 2004. (Unit I – V)
2. Encyclopedia of Nanotechnology - Hari Singh Nalwa 2004. (Unit I – V)

REFERENCES:

1. Nanomaterials, Nanotechnologies and Design: an Introduction to Engineers and Architects, D. Michael Ashby, Paulo Ferreira, Daniel L. Schodek, Butterworth-Heinemann, 2009.

2. Handbook of Nanophase and Nanostructured Materials (in four volumes), Eds: Z.L. Wang, Y. Liu, Z. Zhang, Kluwer Academic/Plenum Publishers, 2003.
3. Handbook of Nanoceramics and their Based Nanodevices (Vol. 2) Edited by Tseung-Yuen Tseng and Hari Singh Nalwa, American Scientific Publishers.

ELECTIVE – I
SEMESTER V

20152E56F **HUMAN RIGHTS** **L T P C**
3 0 0 3

OBJECTIVE:

- To sensitize the Engineering students to various aspects of Human Rights.

UNIT I **9**

Human Rights – Meaning, origin and Development. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social and Cultural Rights; collective / Solidarity Rights.

UNIT II **9**

Evolution of the concept of Human Rights Magana 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 Disabled persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission – Judiciary – Role of NGO‘s, Media, Educational Institutions, Social Movements.

TOTAL: 45 PERIODS

OUTCOME :

- Engineering students will acquire the basic knowledge of human rights.

REFERENCES:

1. Kapoor S.K., ―Human Rights under International law and Indian 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.

ELECTIVE – I
SEMESTER V

20152E56G TOTAL QUALITY MANAGEMENT

L T P C
3 0 0 3

OBJECTIVE:

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

UNIT I INTRODUCTION 9

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

UNIT II TQM PRINCIPLES 9

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

UNIT III TQM TOOLS AND TECHNIQUES I 9

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

UNIT IV TQM TOOLS AND TECHNIQUES II 9

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

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration-
ENVIRONMENTAL MANAGEMENT SYSTEM: Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001—Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOME:

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

TEXT BOOK:

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

REFERENCES:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.
3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
4. ISO9001-2015 standards

SEMESTER V

20152L57 DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made:

- To perform basic signal processing operations such as Linear Convolution, Circular Convolution, Auto Correlation, Cross Correlation and Frequency analysis in MATLAB
- To implement FIR and IIR filters in MATLAB and DSP Processor
- To study the architecture of DSP processor
- To design a DSP system to demonstrate the Multi-rate and Adaptive signal processing concepts.

LIST OF EXPERIMENTS:

MATLAB / EQUIVALENT SOFTWARE PACKAGE

1. Generation of elementary Discrete-Time sequences
2. Linear and Circular convolutions
3. Auto correlation and Cross Correlation
4. Frequency Analysis using DFT
5. Design of FIR filters (LPF/HPF/BPF/BSF) and demonstrates the filtering operation
6. Design of Butterworth and Chebyshev IIR filters (LPF/HPF/BPF/BSF) and demonstrate the filtering operations

DSP PROCESSOR BASED IMPLEMENTATION

1. Study of architecture of Digital Signal Processor
2. Perform MAC operation using various addressing modes
3. Generation of various signals and random noise
4. Design and demonstration of FIR Filter for Low pass, High pass, Band pass and Band stop filtering
5. Design and demonstration of Butter worth and Chebyshev IIR Filters for Low pass, High pass, Band pass and Band stop filtering
6. Implement an Up-sampling and Down-sampling operation in DSP Processor

TOTAL: 60 PERIODS

OUTCOMES:

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

- Carryout basic signal processing operations
- Demonstrate their abilities towards MATLAB based implementation of various DSP systems
- Analyze the architecture of a DSP Processor
- Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals
- Design a DSP system for various applications of DSP

SEMESTER V

20152L58 COMMUNICATION SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made:

- To visualize the effects of sampling and TDM
- To Implement AM & FM modulation and demodulation
- To implement PCM & DM
- To simulate Digital Modulation schemes
- To simulate Error control coding schemes

LIST OF EXPERIMENTS:

1. Signal Sampling and reconstruction
2. Time Division Multiplexing
3. AM Modulator and Demodulator
4. FM Modulator and Demodulator
5. Pulse Code Modulation and Demodulation
6. Delta Modulation and Demodulation
7. Line coding schemes
8. Simulation of ASK, FSK, and BPSK generation schemes
9. Simulation of DPSK, QPSK and QAM generation schemes
10. Simulation of signal constellations of BPSK, QPSK and QAM
11. Simulation of ASK, FSK and BPSK detection schemes
12. Simulation of Linear Block and Cyclic error control coding schemes
13. Simulation of Convolutional coding scheme
14. Communication link simulation

TOTAL: 60 PERIODS

OUTCOMES:

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

- Simulate & validate the various functional modules of a communication system
- Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes
- Apply various channel coding schemes & demonstrate their capabilities towards the improvement of the noise performance of communication system
- Simulate end-to-end communication Link

20152L59 COMMUNICATION NETWORKS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made to:

- Learn to communicate between two desktop computers
- Learn to implement the different protocols
- Be familiar with IP Configuration
- Be familiar with the various routing algorithms
- Be familiar with simulation tools

LIST OF EXPERIMENTS:

1. Implementation of Error Detection / Error Correction Techniques
2. Implementation of Stop and Wait Protocol and sliding window
3. Implementation and study of Goback-N and selective repeat protocols
4. Implementation of High Level Data Link Control
5. Implementation of IP Commands such as ping, Traceroute, nslookup.
6. Implementation of IP address configuration.
7. To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
8. Network Topology - Star, Bus, Ring
9. Implementation of distance vector routing algorithm
10. Implementation of Link state routing algorithm
11. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
12. Implementation of Encryption and Decryption Algorithms using any programming language

TOTAL: 60 PERIODS

OUTCOMES:

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

- Communicate between two desktop computers
- Implement the different protocols
- Program using sockets.
- Implement and compare the various routing algorithms
- Use the simulation tool.

SEMESTER V

20152CRM RESEARCH METHODOLOGY

L T P C
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 – 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.

SEMESTER V

201AGIE **INNOVATION AND ENTREPRENEURSHIP** **L T P C**
0 0 0 2

Module – I
Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions-characteristics, traits and behavioral; entrepreneurial challenges.

Module-II
Module Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Module –III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches**,** Effectuation and Causation.

Module-IV
Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Module – V
Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

COURSE OUTCOMES:
After the completion of the course, the students will be able to:

- Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
- Demonstrate an ability to design a business model canvas.
- Evaluate the various sources of raising finance for startup ventures.
- Understand the fundamentals of developing and presenting business pitching to potential investors.

REFERENCES:

- Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
- Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
- S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
- T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013)
- Osterwalder, Alex and Pigneur, Yves (2010) Business Model Generation.
- Kachru, Upendra, India Land of a Billion Entrepreneurs, Pearson
- Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Portfolio Penguin
- Bagchi, Subroto, (2012). MBA At 16: a Teenager's Guide to Business, Penguin Books
- Bansal, Rashmi, Stay Hungry Stay Foolish, CIIE, IIM Ahmedabad
- Bansal, Rashmi, (2013). Follow Every Rainbow, Westland.

- Mitra, Sramana (2008), Entrepreneur Journeys (Volume 1), Booksurge Publishing
- Abrams, R. (2006). Six-week Start-up, Prentice-Hall of India.
- Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing.
- Johnson, Steven (2011). Where Good Ideas comes from, Penguin Books Limited.
- Gabor, Michael E. (2013), Awakening the Entrepreneur Within, Primento.
- Guillebeau, Chris (2012), The $100 startup: Fire your Boss, Do what you love and work better to live more, Pan Macmillan
- Kelley, Tom (2011), The ten faces of innovation, Currency Doubleday
- Prasad, Rohit (2013), Start-up sutra: what the angels won't tell you about business and life, Hachette India.

SEMESTER VI

20152C61 MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits – Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TOTAL: 45 PERIODS

OUTCOMES:

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

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design‖, Second Edition, Prentice Hall of India, 2007. (UNIT I-III)
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, ―The 8051 Microcontroller and Embedded Systems: Using Assembly and C‖, Second Edition, Pearson education, 2011. (UNIT IV-V)

REFERENCES:

1. Doughlas V.Hall, ―Microprocessors and Interfacing, Programming and Hardware‖,TMH,2012
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

SEMESTER VI

20152C62 VLSI DESIGN L T P C
3 0 0 3

OBJECTIVES:

- Study the fundamentals of CMOS circuits and its characteristics.
- Learn the design and realization of combinational & sequential digital circuits.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed
- Learn the different FPGA architectures and testability of VLSI circuits.

UNIT I INTRODUCTION TO MOS TRANSISTOR 9

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V Charters tics, C-V Charters tics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II COMBINATIONAL MOS LOGIC CIRCUITS 9

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.
Power: Dynamic Power, Static Power, Low Power Architecture.

UNIT III SEQUENTIAL CIRCUIT DESIGN 9

Static latches and Registers, Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.
Timing Issues : Timing Classification Of Digital System, Synchronous Design.

UNIT IV DESIGN OF ARITHMETIC BUILDING BLOCKS AND SUBSYSTEM 9

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.
Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry.

UNIT V IMPLEMENTATION STRATEGIES AND TESTING 9

FPGA Building Block Architectures, FPGA Interconnect Routing Procedures. Design for Testability: *Ad Hoc* Testing, Scan Design, BIST, IDDQ Testing, Design for Manufacturability, Boundary Scan.

TOTAL: 45 PERIODS

OUTCOMES:
UPON COMPLETION OF THE COURSE, STUDENTS SHOULD be ABLE TO

- Realize the concepts of digital building blocks using MOS transistor.
- Design combinational MOS circuits and power strategies.
- Design and construct Sequential Circuits and Timing systems.
- Design arithmetic building blocks and memory subsystems.
- Apply and implement FPGA design flow and testing.

TEXT BOOKS:

1. Neil H.E. Weste, David Money Harris ―CMOS VLSI Design: A Circuits and Systems Perspective‖, 4th Edition, Pearson , 2017 (UNIT I,II,V)
2. Jan M. Rabaey ,Anantha Chandrakasan, Borivoje. Nikolic, ‖Digital Integrated Circuits:A Design perspective‖, Second Edition , Pearson , 2016.(UNIT III,IV)

REFERENCES

1. M.J. Smith, ―Application Specific Integrated Circuits‖, Addisson Wesley, 1997
2. Sung-Mo kang, Yusuf leblebici, Chulwoo Kim ―CMOS Digital Integrated Circuits:Analysis & Design‖,4th edition McGraw Hill Education,2013
3. Wayne Wolf, ―Modern VLSI Design: System On Chip‖, Pearson Education, 2007
4. R.Jacob Baker, Harry W.LI., David E.Boyee, ―CMOS Circuit Design, Layout and Simulation‖, Prentice Hall of India 2005.

SEMESTER VI

20152C63 WIRELESS COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study the characteristic of wireless channel
- To understand the design of a cellular system
- To study the various digital signaling techniques and multipath mitigation techniques
- To understand the concepts of multiple antenna techniques

UNIT I WIRELESS CHANNELS 9

Large scale path loss – Path loss models: Free Space and Two-Ray models -Link Budget design – Small scale fading- Parameters of mobile multipath channels – Time dispersion parameters-Coherence bandwidth – Doppler spread & Coherence time, fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT II CELLULAR ARCHITECTURE 9

Multiple Access techniques - FDMA, TDMA, CDMA – Capacity calculations–Cellular concept-Frequency reuse - channel assignment- hand off- interference & system capacity-trunking & grade of service – Coverage and capacity improvement.

UNIT III DIGITAL SIGNALING FOR FADING CHANNELS 9

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT IV MULTIPATH MITIGATION TECHNIQUES 9

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

UNIT V MULTIPLE ANTENNA TECHNIQUES 9

MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming - transmitter diversity, receiver diversity- Channel state information-capacity in fading and non-fading channels.

TOTAL: 45 PERIODS

OUTCOMES:

The student should be able to:

- Characterize a wireless channel and evolve the system design specifications
- Design a cellular system based on resource availability and traffic demands
- Identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration.

TEXT BOOKS:

1. Rappaport,T.S., ―Wireless communications‖, Pearson Education, Second Edition,2010.(UNIT I, II, IV)
2. Andreas.F. Molisch, ―Wireless Communications‖, John Wiley – India, 2006. (UNIT III,V)

REFERENCES:

1. Wireless Communication –Andrea Goldsmith, Cambridge University Press, 2011
2. Van Nee, R. and Ramji Prasad, ―OFDM for wireless multimedia communications, Artech House, 2000
3. David Tse and Pramod Viswanath, ― Fundamentals of Wireless Communication, Cambridge University Press, 2005.
4. Upena Dalal, ―Wireless Communication‖, Oxford University Press, 2009.

SEMESTER VI

20152S64 PRINCIPLES OF MANAGEMENT

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

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

UNIT II PLANNING 9

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

UNIT III ORGANISING 9

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

UNIT IV DIRECTING 9

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

UNIT V CONTROLLING 9

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

TOTAL: 45 PERIODS

OUTCOME:

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

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, ―Management‖, Prentice Hall (India) Pvt. Ltd., 10th 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.

SEMESTER VI

20152C65 TRANSMISSION LINES AND RF SYSTEMS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the various types of transmission lines and its characteristics
- To give thorough understanding about high frequency line, power and impedance measurements
- To impart technical knowledge in impedance matching using smith chart
- To introduce passive filters and basic knowledge of active RF components
- To get acquaintance with RF system transceiver design

UNIT I TRANSMISSION LINE THEORY 9

General theory of Transmission lines - the transmission line - general solution - The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion-less line - Loading and different methods of loading - Line not terminated in Z0 - Reflection coefficient - calculation of current, voltage, power delivered and efficiency of transmission - Input and transfer impedance - Open and short circuited lines - reflection factor and reflection loss.

UNIT II HIGH FREQUENCY TRANSMISSION LINES 9

Transmission line equations at radio frequencies - Line of Zero dissipation - Voltage and current on the dissipation-less line, Standing Waves, Nodes, Standing Wave Ratio - Input impedance of the dissipation-less line - Open and short circuited lines - Power and impedance measurement on lines - Reflection losses - Measurement of VSWR and wavelength.

UNIT III IMPEDANCE MATCHING IN HIGH FREQUENCY LINES 9

Impedance matching: Quarter wave transformer - Impedance matching by stubs - Single stub and double stub matching - Smith chart - Solutions of problems using Smith chart - Single and double stub matching using Smith chart.

UNIT IV WAVEGUIDES 9

General Wave behavior along uniform guiding structures – Transverse Electromagnetic Waves, Transverse Magnetic Waves, Transverse Electric Waves – TM and TE Waves between parallel plates. Field Equations in rectangular waveguides, TM and TE waves in rectangular waveguides, Bessel Functions, TM and TE waves in Circular waveguides.

UNIT V RF SYSTEM DESIGN CONCEPTS 9

Active RF components: Semiconductor basics in RF, bipolar junction transistors, RF field effect transistors, High electron mobility transistors Basic concepts of RF design, Mixers, Low noise amplifiers, voltage control oscillators, Power amplifiers, transducer power gain and stability considerations.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student should be able to:

- Explain the characteristics of transmission lines and its losses
- Write about the standing wave ratio and input impedance in high frequency transmission lines
- Analyze impedance matching by stubs using smith charts
- Analyze the characteristics of TE and TM waves
- Design a RF transceiver system for wireless communication

TEXT BOOKS:

1. John D Ryder, ―Networks, lines and fields‖, 2nd Edition, Prentice Hall India, 2015. (UNIT I-IV)
2. Mathew M. Radmanesh, ―Radio Frequency &Microwave Electronics‖, Pearson Education Asia, Second Edition, 2002. (UNIT V)

REFERENCES:

1. Reinhold Ludwig and Powel Bretchko,‖ RF Circuit Design – Theory and Applications‖, Pearson Education Asia, First Edition,2001.
2. D. K. Misra, ―Radio Frequency and Microwave Communication Circuits- Analysis and Design‖, John Wiley & Sons, 2004.
3. E.C.Jordan and K.G. Balmain, ―Electromagnetic Waves and Radiating Systems Prentice Hall of India, 2006.
4. G.S.N Raju, "Electromagnetic Field Theory and Transmission Lines Pearson Education, First edition 2005.

LIST OF ELECTIVES

ELECTIVE – II (SEMESTER VI)

ELECTIVE – II
SEMESTER VI

20152E66A CRYPTOGRAPHY AND NETWORK SECURITY **L T P C**
3 0 0 3

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.

UNIT I INTRODUCTION 9
Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography).- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC CRYPTOGRAPHY 9
MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid‘s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS**:** 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.

UNIT III PUBLIC KEY CRYPTOGRAPHY 9
MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY 9
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY 9
Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the 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

ELECTIVE – II
SEMESTER VI

20152E66B ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 0 0 3

OBJECTIVES:

- To learn and understand the concepts of stationary and non-stationary random signals and analysis & characterization of discrete-time random processes
- To enunciate the significance of estimation of power spectral density of random processes
- To introduce the principles of optimum filters such as Wiener and Kalman filters
- To introduce the principles of adaptive filters and their applications to communication engineering
- To introduce the concepts of multi-resolution analysis

UNIT I DISCRETE-TIME RANDOM PROCESSES 9

Random variables - ensemble averages a review, random processes - ensemble averages, autocorrelation and autocovariance matrices, ergodic random process, white noise, filtering random processes, spectral factorization, special types of random processes - AR, MA, ARMA

UNIT II SPECTRUM ESTIMATION 10

Bias and consistency, Non-parametric methods - Periodogram, modified-Periodogram - performance analysis. Bartlett's method, Welch's method, Blackman-Tukey method. Performance comparison. Parametric methods - autoregressive (AR) spectrum estimation - autocorrelation method, Prony's method, solution using Levinson Durbin recursion.

UNIT III OPTIMUM FILTERS 9

Wiener filters - FIR Wiener filter - discrete Wiener Hopf equation, Applications - filtering, linear prediction. IIR Wiener filter - causal and non-causal filters. Recursive estimators - discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles and properties of adaptive filters - FIR adaptive filters. Adaptive algorithms - steepest descent algorithm, the LMS algorithm - convergence. Applications of adaptive filtering - noise cancellation, channel equalization.

UNIT V MULTIRESOLUTION ANALYSIS 8

Short-time Fourier transform - Heisenberg uncertainty principle. Principles of multi-resolution analysis - sub-band coding, the continuous and discrete wavelet transform - properties. Applications of wavelet transform - noise reduction, image compression.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Articulate and apply the concepts of special random processes in practical applications
- Choose appropriate spectrum estimation techniques for a given random process
- Apply optimum filters appropriately for a given communication application
- Apply appropriate adaptive algorithm for processing non-stationary signals
- Apply and analyse wavelet transforms for signal and image processing based applications

TEXT BOOKS

1. Monson H. Hayes, "Statistical digital signal processing and modeling", John Wiley and Sons Inc. New York, Indian reprint 2008. (UNIT I-IV)
2. P. P. Vaidyanathan, "Multirate systems and filter banks", Prentice Hall Inc. 1993 (UNIT V)

REFERENCES:

1. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007.
2. Sophoncles J. Orfanidis, "Optimum signal processing", McGraw Hill, 2000

ELECTIVE – II
SEMESTER VI

20152E66C MEMS AND NEMS **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce the concepts of micro and nano electromechanical devices
- To know the fabrication process of Microsystems
- To know the design concepts of micro sensors and micro actuators
- To introduce the concepts of quantum mechanics and nano systems

UNIT I INTRODUCTION TO MEMS AND NEMS 9
Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT II MEMS FABRICATION TECHNOLOGIES 9
Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

UNIT III MICRO SENSORS 9
MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester

UNIT IV MICRO ACTUATORS 9
Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study:RF Switch.

UNIT V NANO DEVICES 9
Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device: Gas sensor.

TOTAL: 45 PERIODS

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

- Interpret the basics of micro/nano electromechanical systems including their applications and advantages
- Recognize the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
- Analyze the key performance aspects of electromechanical transducers including sensors and actuators
- Comprehend the theoretical foundations of quantum mechanics and Nano systems

REFERENCES:

1. Marc Madou, ―Fundamentals of Microfabrication‖, CRC press 1997.
2. Stephen D. Senturia,‖ Micro system Design‖, Kluwer Academic Publishers,2001
3. Tai Ran Hsu ,‖MEMS and Microsystems Design and Manufacture‖ ,Tata Mcraw Hill, 2002.
4. Chang Liu, ―Foundations of MEMS‖, Pearson education India limited, 2006,
5. Sergey Edward Lyshevski, ―MEMS and NEMS: Systems, Devices, and Structures‖ CRC Press, 2002

20152E66D MULTIMEDIA COMPRESSION AND COMMUNICATION

L	T	P	C
3	0	0	3

OBJECTIVES:
The student should be made:
- To understand the compression schemes for text, voice, image and video
- To understand the QoS issues in multimedia network
- To know the communication protocols for multimedia networking

UNIT I AUDIO COMPRESSION 9
Sampling and Quantization of Speech (PCM) - Adaptive differential PCM - Delta Modulation - Vector Quantization- Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT II IMAGE AND VIDEO COMPRESSION 9
Graphics Interchange format- Tagged image file format-Digitized documents- Digitized pictures-JPEG-Video Encoding-Motion estimation –Overview of H.263 and MPEG-2

UNIT III TEXT COMPRESSION 7
Static and Dynamic Huffman coding – Arithmetic coding –Lempel-Ziv coding – LZW coding

UNIT IV GUARANTEED SERVICE MODEL 10
Best Effort service model – Scheduling and Dropping policies – Network Performance Parameters – Quality of Service and metrics – WFQ and its variants – Random Early Detection – QoS aware Routing – Admission Control – Resource Reservation – RSVP - Traffic Shaping Algorithms – Caching – Laissez Faire Approach - Possible Architectures – An Overview of QoS Architectures

UNIT V MULTIMEDIA COMMUNICATION 10
Stream characteristics for Continuous media – Temporal Relationship – Object Stream Interactions, Media Levity, Media Synchronization – Models for Temporal Specifications – Streaming of Audio and Video – Jitter – Fixed playout and Adaptive playout – Recovering from packet loss – RTSP –– Multimedia Communication Standards – RTP/RTCP – SIP and H.263

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design audio compression techniques
- Configure Text, image and video compression techniques
- Select suitable service model for specific application
- Configure multimedia communication network

TEXT BOOK:
1. Fred Halsall, ―Multimedia communication- Applications, Networks, Protocols and Standards‖, Pearson education, 2007.

REFERENCES
1. Tay Vaughan, ―Multimedia Making it work **,** McGraw-Hill Osborne Media, 2006.
2. Kurose and W. Ross, ―Computer Networking ―A Top Down Approach, Pearson education, 3rd ed, 2005.
3. KR. Rao,Z S Bojkovic, D A Milovanovic, ―Multimedia Communication Systems: Techniques, Standards, and Networks‖, Pearson Education 2007

4. R. Steimnetz, K. Nahrstedt, ―Multimedia Computing, Communications and Applications‖, Pearson Education, First ed, 1995.
5. Nalin K Sharda, _Multimedia Information Networking', Prentice Hall of India, 1999
6. Aura Ganz, Zvi Ganz and Kitti Wongthawaravat, _Multimedia Wireless Networks: Technologies, Standards and QoS', Prentice Hall, 2003.
7. Ellen Kayata Wesel, _Wireless Multimedia Communications: Networking Video, Voice and Data', Addision Wesley, 1998

ELECTIVE – II
SEMESTER VI

20152E66E CMOS ANALOG IC DESIGN L T P C
3 0 0 3

OBJECTIVES:

- To study the fundamentals of analog circuits and MOS device models
- To gain knowledge on various configurations of MOS transistors and feedback concepts
- To study the characteristics of noise and frequency response of the amplifier
- To learn the concepts of Op-Amp frequency compensation, capacitor switches and PLLs

UNIT I INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS 9

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors- Cascode current mirrors-
Active current mirrors- Large and Small signal analysis- Common mode properties.

UNIT II AMPLIFIERS AND FEEDBACK 9

Basic Concepts – Common source stage- Source follower- Common gate stage- Cascode stage. Single ended and differential operation- Basic Differential pair- Common mode response-Differential pair with MOS loads- Gilbert Cell. Feedback- General Consideration of feedback circuits- Feedback topologies- Effect of loading- Effect of feedback on Noise.

UNIT III FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE 9

General considerations- Miller Effect and Association of Poles with Nodes, Common source stage-Source followers- Common gate stage- Cascode stage- Differential pair. Noise- Statistical characteristics of noise- Types of noise- Representation of noise in circuits- Noise in single stage amplifiers- Noise in differential pairs- Noise Bandwidth.

UNIT IV OPERATIONAL AMPLIFIER STABILITY AND FREQUENCY COMPENSATION 9

General Considerations- One and Two Stage Op Amps- Gain Boosting- Comparison- Common mode feedback- Input range limitations- Slew rate- Power Supply Rejection- Noise in Op Amps-General consideration of stability and frequency compensation- Multipole system- Phase margin-Frequency compensation- Compensation of two stage op Amps- Other compensation techniques.

UNIT V SWITCHED CAPACITOR CIRCUITS AND PLLS 9

General Considerations- Sampling switches- Switched Capacitor Amplifiers- Switched Capacitor Integrator- Switched Capacitor Common mode feedback. Phase Locked Loops-Simple PLL-Charge pump PLLs - Non ideal Effects in PLLs- Delay locked loops- its Applications.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, student should be able to:

- Realize the concepts of Analog MOS devices and current mirror circuits.
- Design different configuration of Amplifiers and feedback circuits.
- Analyze the characteristics of frequency response of the amplifier and its noise.
- Analyze the performance of the stability and frequency compensation techniques of Op-Amp Circuits.
- Construct switched capacitor circuits and PLLs

TEXT BOOK:

1. Behzad Razavi, ―Design of Analog CMOS Integrated Circuits‖, Tata McGraw Hill, 2001, 33rd re-print, 2016.

REFERENCES:

1. Phillip Allen and Douglas Holmberg ―CMOS Analog Circuit Design‖ Second Edition, Oxford University Press, 2004.
2. Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Analysis and Design of Analog Integrated Circuits, 5th Edition, Wiley, 2009
3. Grebene, ―Bipolar and MOS Analog Integrated circuit design‖, John Wiley & sons, Inc., 2003

ELECTIVE – II
SEMESTER VI

20152E66F **WIRELESS NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made:

- To understand the concept about Wireless networks, protocol stack and standards
- To understand and analyse the network layer solutions for Wireless networks
- To study about fundamentals of 3G Services, its protocols and applications
- To have in depth knowledge on internetworking of WLAN and WWAN
- To learn about evolution of 4G Networks, its architecture and applications

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: - IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, WPAN – IEEE 802.15.4, Wireless USB, Zigbee, 6LoWPAN, WirelessHART

UNIT II MOBILE NETWORK LAYER 9

Introduction - Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol - mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP

UNIT III 3G OVERVIEW 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview- Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT IV INTERNETWORKING BETWEEN WLANS AND WWANS 9

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

UNIT V 4G & Beyond 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, the student would be able to:

- Conversant with the latest 3G/4G networks and its architecture
- Design and implement wireless network environment for any application using latest wireless protocols and standards
- Ability to select the suitable network depending on the availability and requirement
- Implement different type of applications for smart phones and mobile devices with latest network strategies

TEXT BOOKS:

1. Jochen Schiller, ‖Mobile Communications‖, Second Edition, Pearson Education 2012.(Unit I,II,III)
2. Vijay Garg, ―Wireless Communications and networking‖, First Edition, Elsevier 2007. (Unit IV,V)

REFERENCES:

1. Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband‖, Second Edition, Academic Press, 2008.
2. Anurag Kumar, D.Manjunath, Joy kuri, ―Wireless Networking‖, First Edition, Elsevier 2011.
3. Simon Haykin , Michael Moher, David Koilpillai, ―Modern Wireless Communications‖, First Edition, Pearson Education 2013

ELECTIVE – II
SEMESTER VI

20152E66G INTELLECTUAL PROPERTY RIGHTS **L T P C**
3 0 0 3

OBJECTIVE:

- To give an idea about IPR, registration and its enforcement.

UNIT I INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT II REGISTRATION OF IPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad

UNIT III AGREEMENTS AND LEGISLATIONS 10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and Digital Content Protection – Unfair Competition – Meaning and Relationship between Unfair Competition and IP Laws – Case Studies.

UNIT V ENFORCEMENT OF IPRs 7

Infringement of IPRs, Enforcement Measures, Emerging issues – Case Studies.

TOTAL: 45 PERIODS

OUTCOME:

- Ability to manage Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS:

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

REFERENCES:

1. Deborah E. Bouchoux, ―Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets‖, Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli,‖Intellectual Property Rights: Unleashing the Knowledge Economy‖, McGraw Hill Education, 2011.
3. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.

SEMESTER VI

20152L61 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
1. Traffic light controller
2. Stepper motor control
3. Digital clock
4. Key board and Display
5. Printer status
6. Serial interface and Parallel interface
7. A/D and D/A interface and Waveform Generation

8051 Experiments using kits and MASM
1. Basic arithmetic and Logical operations
2. Square and Cube program, Find 2‘s complement of a number
3. Unpacked BCD to ASCII

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Write ALP Programmes for fixed and Floating Point and Arithmetic operations
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

SEMESTER VI

20152L62 **VLSI DESIGN LABORATORY**

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made:

- To learn Hardware Descriptive Language(Verilog/VHDL)
- To learn the fundamental principles of VLSI circuit design in digital and analog domain
- To familiarize fusing of logical modules on FPGAs
- To provide hands on design experience with professional design (EDA) platforms

LIST OF EXPERIMENTS:

Part I: Digital System Design using HDL & FPGA **(24 Periods)**

1. Design an Adder (Min 8 Bit) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
2. Design a Multiplier (4 Bit Min) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
3. Design an ALU using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
4. Design a Universal Shift Register using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
5. Design Finite State Machine (Moore/Mealy) using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA
6. Design Memories using HDL. Simulate it using Xilinx/Altera Software and implement by Xilinx/Altera FPGA

Compare pre synthesis and post synthesis simulation for experiments 1 to 6.

Part-II Digital Circuit Design **(24 Periods)**

7. Design and simulate a CMOS inverter using digital flow
8. Design and simulate a CMOS Basic Gates & Flip-Flops
9. Design and simulate a 4-bit synchronous counter using a Flip-Flops

Manual/Automatic Layout Generation and Post Layout Extraction for experiments 7 to 9
Analyze the power, area and timing for experiments 7 to 9 by performing Pre Layout and Post Layout Simulations.

Part-III Analog Circuit Design **(12 Periods)**

10. Design and Simulate a CMOS Inverting Amplifier.
11. Design and Simulate basic Common Source, Common Gate and Common Drain Amplifiers.

Analyze the input impedance, output impedance, gain and bandwidth for experiments 10 and 11 by performing Schematic Simulations.
Design and simulate simple 5 transistor differential amplifier. Analyze Gain, Bandwidth and CMRR by performing Schematic Simulations.

TOTAL :60 PERIODS

OUTCOMES:

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

- Write HDL code for basic as well as advanced digital integrated circuit
- Import the logic modules into FPGA Boards
- Synthesize Place and Route the digital IPs
- Design, Simulate and Extract the layouts of Digital & Analog IC Blocks using EDA tools

SEMESTER VI

20152L63 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 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.

SEMESTER VII

20152C71 ANTENNAS AND MICROWAVE ENGINEERING

L T P C
3 0 0 3

OBJECTIVES:

- To enable the student to understand the basic principles in antenna and microwave system design
- To enhance the student knowledge in the area of various antenna designs.
- To enhance the student knowledge in the area of microwave components and antenna for practical applications.

UNIT I INTRODUCTION TO MICROWAVE SYSTEMS AND ANTENNAS 9

Microwave frequency bands, Physical concept of radiation, Near- and far-field regions, Fields and Power Radiated by an Antenna, Antenna Pattern Characteristics, Antenna Gain and Efficiency, Aperture Efficiency and Effective Area, Antenna Noise Temperature and G/T, Impedance matching, Friis transmission equation, Link budget and link margin, Noise Characterization of a microwave receiver.

UNIT II RADIATION MECHANISMS AND DESIGN ASPECTS 9

Radiation Mechanisms of Linear Wire and Loop antennas, Aperture antennas, Reflector antennas, Microstrip antennas and Frequency independent antennas, Design considerations and applications.

UNIT III ANTENNA ARRAYS AND APPLICATIONS 9

Two-element array, Array factor, Pattern multiplication, Uniformly spaced arrays with uniform and non-uniform excitation amplitudes, Smart antennas.

UNIT IV PASSIVE AND ACTIVE MICROWAVE DEVICES 9

Microwave Passive components: Directional Coupler, Power Divider, Magic Tee, attenuator, resonator, Principles of Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes, Microwave tubes: Klystron, TWT, Magnetron.

UNIT V MICROWAVE DESIGN PRINCIPLES 9

Impedance transformation, Impedance Matching, Microwave Filter Design, RF and Microwave Amplifier Design, Microwave Power amplifier Design, Low Noise Amplifier Design, Microwave Mixer Design, Microwave Oscillator Design

TOTAL: 45 PERIODS

OUTCOMES:

The student should be able to:

- Apply the basic principles and evaluate antenna parameters and link power budgets
- Design and assess the performance of various antennas
- Design a microwave system given the application specifications

TEXTBOOKS:

1. John D Krauss, Ronald J Marhefka and Ahmad S. Khan, "Antennas and Wave Propagation: Fourth Edition, Tata McGraw-Hill, 2006. (UNIT I, II, III)
2. David M. Pozar, "Microwave Engineering", Fourth Edition, Wiley India, 2012.(UNIT I,IV,V)

REFERENCES:

1. Constantine A.Balanis, ―Antenna Theory Analysis and Design‖, Third edition, John Wiley India Pvt Ltd., 2005.
2. R.E.Collin, "Foundations for Microwave Engineering", Second Edition, IEEE Press, 2001.

SEMESTER VII

20152C72 **OPTICAL COMMUNICATION**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To study about the various optical fiber modes, configuration and transmission characteristics of optical fibers
- To learn about the various optical sources, detectors and transmission techniques
- To explore various idea about optical fiber measurements and various coupling techniques
- To enrich the knowledge about optical communication systems and networks

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Introduction-general optical fiber communication system- basic optical laws and definitions-optical modes and configurations -mode analysis for optical propagation through fibers-modes in planar wave guide-modes in cylindrical optical fiber-transverse electric and transverse magnetic modes- fiber materials-fiber fabrication techniques-fiber optic cables-classification of optical fiber-single mode fiber-graded index fiber.

UNIT II TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER 9

Attenuation-absorption --scattering losses-bending losses-core and cladding losses-signal dispersion – inter symbol interference and bandwidth-intra model dispersion-material dispersion- waveguide dispersion-polarization mode dispersion-intermodal dispersion-dispersion optimization of single mode fiber-characteristics of single mode fiber-R-I Profile-cutoff wave length-dispersion calculation-mode field diameter.

UNIT III OPTICAL SOURCES AND DETECTORS 9

Sources: Intrinsic and extrinsic material-direct and indirect band gaps-LED-LED structures-surface emitting LED-Edge emitting LED-quantum efficiency and LED power-light source materials-modulation of LED-LASER diodes-modes and threshold conditions-Rate equations-external quantum efficiency-resonant frequencies-structures and radiation patterns-single mode laser-external modulation-temperature effort.

Detectors: PIN photo detector-Avalanche photo diodes-Photo detector noise-noise sources-SNR-detector response time-Avalanche multiplication noise-temperature effects-comparisons of photo detectors.

UNIT IV OPTICAL RECEIVER, MEASUREMENTS AND COUPLING 9

Fundamental receiver operation-preamplifiers-digital signal transmission-error sources-Front end amplifiers-digital receiver performance-probability of error-receiver sensitivity-quantum limit. Optical power measurement-attenuation measurement-dispersion measurement- Fiber Numerical Aperture Measurements- Fiber cut- off Wave length Measurements- Fiber diameter measurements-Source to Fiber Power Launching-Lensing Schemes for Coupling Management-Fiber to Fiber Joints-LED Coupling to Single Mode Fibers-Fiber Splicing-Optical Fiber connectors.

UNIT V OPTICAL COMMUNICATION SYSTEMS AND NETWORKS 9

System design consideration Point – to –Point link design –Link power budget –rise time budget, WDM –Passive DWDM Components-Elements of optical networks-SONET/SDH-Optical Interfaces-SONET/SDH Rings and Networks-High speed light wave Links-OADM configuration-Optical ETHERNET-Soliton.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Realize basic elements in optical fibers, different modes and configurations.
- Analyze the transmission characteristics associated with dispersion and polarization techniques.

- Design optical sources and detectors with their use in optical communication system.
- Construct fiber optic receiver systems, measurements and coupling techniques.
- Design optical communication systems and its networks.

TEXT BOOKS:

1. P Chakrabarti, "Optical Fiber Communication‖, McGraw Hill Education (India) Private Limited**,** 2016 (UNIT I, II, III)
2. Gerd Keiser,"Optical Fiber Communication‖, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013. (UNIT I, IV, V)

REFERENCES:

1. John M.Senior, ―Optical fiber communication‖, Pearson Education, Second Edition.2007.
2. Rajiv Ramaswami, ―Optical Networks ― , Second Edition, Elsevier , 2004.
3. J.Gower, ―Optical Communication System‖, Prentice Hall of India, 2001.
4. Govind P. Agrawal, ―Fiber-optic communication systems‖, third edition, John Wiley & Sons, 2004.

SEMESTER VII

20152C73	EMBEDDED AND REAL TIME SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Understand the concepts of embedded system design and analysis
- Learn the architecture and programming of ARM processor
- Be exposed to the basic concepts of embedded programming
- Learn the real time operating systems

UNIT I INTRODUCTION TO EMBEDDEDSYSTEM DESIGN 9

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Design methodologies- Design flows - Requirement Analysis – Specifications-System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform-level performance analysis.

UNIT II ARM PROCESSOR AND PERIPHERALS 9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

UNIT III EMBEDDED PROGRAMMING 9

Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT IV REAL TIME SYSTEMS 9

Structure of a Real Time System –– Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronisation.

UNIT V PROCESSES AND OPERATING SYSTEMS 9

Introduction – Multiple tasks and multiple processes – Multirate systems- Preemptive real time operating systems- Priority based scheduling- Interprocess communication mechanisms – Evaluating operating system performance- power optimization strategies for processes – Example Real time operating systems-POSIX-Windows CE. - Distributed embedded systems – MPSoCs and shared memory multiprocessors. – Design Example - Audio player, Engine control unit – Video accelerator.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Describe the architecture and programming of ARM processor
- Outline the concepts of embedded systems
- Explain the basic concepts of real time operating system design
- Model real-time applications using embedded-system concepts

TEXT BOOKS:

1. Marilyn Wolf, ―Computers as Components - Principles of Embedded Computing System
2. Design‖, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
3. Jane W.S.Liu,‖ Real Time Systems‖, Pearson Education, Third Indian Reprint, 2003. (UNIT IV)

REFERENCES:

1. Lyla B.Das, ―Embedded Systems : An Integrated Approach‖ Pearson Education, 2013.
2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Time Interfacing‖, Third Edition Cengage Learning, 2012.
3. David. E. Simon, ―An Embedded Software Primer‖, 1st Edition, Fifth Impression, Addison Wesley Professional, 2007.
4. Raymond J.A. Buhr, Donald L.Bailey, ―An Introduction to Real-Time Systems- From Design to Networking with C/C++‖, Prentice Hall, 1999.
5. C.M. Krishna, Kang G. Shin, ―Real-Time Systems‖, International Editions, Mc Graw Hill 1997
6. K.V.K.K.Prasad, ―Embedded Real-Time Systems: Concepts, Design & Programming‖, Dream Tech Press, 2005.
7. Sriram V Iyer, Pankaj Gupta, ―Embedded Real Time Systems Programming‖, Tata Mc Graw Hill, 2004.

LIST OF OPEN ELECTIVES

OPEN ELECTIVE – II (SEMESTER VII)

OPEN ELECTIVE – II
SEMESTER VII

20150OE74A INTRODUCTION TO C PROGRAMMING L T P C
3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION 9

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

UNIT II ARRAYS 9

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

UNIT III STRINGS 9

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

UNIT IV FUNCTIONS 9

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

UNIT V STRUCTURES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

- Develop simple applications using basic constructs
- Develop applications using arrays and strings
- Develop applications using functions and structures

TEXT BOOK:

1. Reema Thareja, "Programming in C", Oxford University Press, Second Edition, 2016.

REFERENCES:

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

OPEN ELECTIVE – II
SEMESTER VII

20150OE74B DATA STRUCTURES AND ALGORITHMS L T P C
3 0 0 3

OBJECTIVES:

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

UNIT 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 S TACKS AND QUEUES 7

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

UNIT III SEARCHING AND SORTING ALGORITHMS 10

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

UNIT IV TREES 9

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

UNIT V GRAPHS 8

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

OPEN ELECTIVE – II
SEMESTER VII

20153OE74A BASIC CIRCUIT THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis.
- To impart knowledge on solving circuit equations using network theorems.
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis ofthree phase circuits.

UNIT I BASIC CIRCUITS ANALYSIS 9

Resistive elements -Ohm's Law Resistors in series and parallel circuits –Kirchoffs laws –Mesh current and node voltage -methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation –star delta conversion. Thevenins and Norton Theorems –Superposition Theorem –Maximum power transfer theorem –Reciprocity Theorem –Millman's theorem.

UNIT III AC CIRCUITS 9

Introduction to AC circuits , inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenins and Norton Theorems –Superposition Theorem –Maximum power transfer theorem –Reciprocity Theorem –Millman's theorem.

UNIT IV THREE PHASECIRCUITS 9

A.C. circuits –Average and RMS value -Phasor Diagram –Power, Power Factor and Energy.-Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced –phasor diagram of voltages and currents –power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance –their frequency response –Quality factor and Bandwidth -Self and mutual inductance –Coefficient of coupling –Tuned circuits –Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to introduce electric circuits and its analysis.
- Ability to impart knowledge on solving circuit equations using network theorems.
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams and analysis of three phase circuits.

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.

6. Richard C. Dorf and James A. Svoboda, “Introduction to Electric Circuits”, 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, McGraw Hill, 2015.

20153OE74A INTRODUCTION TO RENEWABLE ENERGY SYSTEMS

L T P C
3 0 0 3

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

UNIT 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 RENEWABLEENERGY CONVERSION 9
Reference theory fundamentals-principle of operation and analysis: IG and PMSG.

UNIT III POWER CONVERTERS 9
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) -Boost and buck-boost converters-selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9
Stand alone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT V HYBRID RENEWABLEENERGY SYSTEMS 9
Need for Hybrid Systems-Range and type of Hybrid systems-Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

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

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

REFERENCES:
1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variability speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, „Introduction to Modern Power Electronics‟, Second edition, Wiley India Pvt. Ltd, 2012.

20154OE74A INDUSTRIAL SAFETY **L T P C**
3 0 0 3

OBJECTIVES :
To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION 9
Evolution of modern safety concepts –Fire prevention –Mechanical hazards –Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS 9
Chemical exposure –Toxic materials –Ionizing Radiation and Non-ionizing Radiation - IndustrialHygiene –Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL 9
Industrial Health Hazards –Environmental Control –Industrial Noise -Noise measuring instruments, Control of Noise, Vibration, -Personal Protection.

UNIT IV HAZARD ANALYSIS 9
System Safety Analysis –Techniques –Fault Tree Analysis (FTA), Failure Modes and Effects Analysis(FMEA), HAZOP analysis and Risk Assessment.

UNIT V SAFETY REGULATIONS 9
Explosions –Disaster management –catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety –case studies.

TOTAL : 45 PERIODS

OUTCOMES:
- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management.

TEXT BOOK:
1. John V.Grimaldi, "Safety Management", AITB S Publishers, 2003.

REFERENCES:
1. Safety Manual, "EDEL Engineering Consultancy", 2000.
2. David L.Goetsch, "Occupational Safety and Health for Technologists", 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

20154OE74B **TESTING OF MATERIALS** **L T P C**
3 0 0 3

OBJECTIVE:
To understand the various destructive and non destructive testing methods of materials and its industrial applications.

UNIT I INTRODUCTION TO MATERIALS TESTING 9
Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II MECHANICAL TESTING 9
Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) -Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test -Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NON DESTRUCTIVE TESTING 9
Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test –Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission-Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING 9
Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) - Principles, Types, Advantages and Limitations,Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques-Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING 9
Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS

OUTCOMES:
- Identify suitable testing technique to inspect industrial component.
- Ability to use the different technique and know its applications and limitations.

TEXT BOOKS:
1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
2. Cullity, B. D., "Elements of X-ray diffraction", 3rdEdition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, "The Mechanical Testing of Metals and Alloys" 7thEdition, Cousens Press, 2007.

REFERENCES:
1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9thEdition, American Society for Metals, 1978.
2. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Societyof Metals, Metals Park, Ohio, USA.
3. BrandonD.G., "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.

OPEN ELECTIVE – II
SEMESTER VII

20155OE74A GREEN BUILDING DESIGN

L T P C
3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings-Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke.

OPEN ELECTIVE – II
SEMESTER VII

20155OE74B **WASTE WATER TREATMENT** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT 9

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

UNIT II INDUSTRIAL WATER TREATMENT 9

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

UNIT III CONVENTIONAL TREATMENT METHODS 9

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

UNIT IV WASTEWATER TREATMENT 9

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

UNIT V ADSORPTION AND OXIDATION PROCESSES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:

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

REFERENCES:

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

SEMESTER VII

19152C75 ADHOC AND WIRELESS SENSOR NETWORKS

L	T	P	C
3	0	0	3

OBJECTIVES:

- Learn Ad hoc network and Sensor Network fundamentals
- Understand the different routing protocols
- Have an in-depth knowledge on sensor network architecture and design issues
- Understand the transport layer and security issues possible in Ad hoc and Sensor networks
- Have an exposure to mote programming platforms and tools

UNIT I AD HOC NETWORKS – INTRODUCTION AND ROUTING PROTOCOLS 9

Elements of Ad hoc Wireless Networks, Issues in Ad hoc wireless networks, Example commercial applications of Ad hoc networking, Ad hoc wireless Internet, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table Driven Routing Protocols - Destination Sequenced Distance Vector (DSDV), On–Demand Routing protocols –Ad hoc On–Demand Distance Vector Routing (AODV).

UNIT II SENSOR NETWORKS – INTRODUCTION & ARCHITECTURES 9

Challenges for Wireless Sensor Networks, Enabling Technologies for Wireless Sensor Networks, WSN application examples, Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Network Architecture - Sensor Network Scenarios, Transceiver Design Considerations, Optimization Goals and Figures of Merit.

UNIT III WSN NETWORKING CONCEPTS AND PROTOCOLS 9

MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, The Mediation Device Protocol, Contention based protocols - PAMAS, Schedule based protocols – LEACH, IEEE 802.15.4 MAC protocol, Routing Protocols-Energy Efficient Routing, Challenges and Issues in Transport layer protocol.

UNIT IV SENSOR NETWORK SECURITY 9

Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Layer wise attacks in wireless sensor networks, possible solutions for jamming, tampering, black hole attack, flooding attack. Key Distribution and Management, Secure Routing – SPINS, reliability requirements in sensor networks.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms – TinyOS, nesC, CONTIKIOS, Node-level Simulators – NS2 and its extension to sensor networks, COOJA, TOSSIM, Programming beyond individual nodes – State centric programming.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Know the basics of Ad hoc networks and Wireless Sensor Networks
- Apply this knowledge to identify the suitable routing algorithm based on the network and user requirement
- Apply the knowledge to identify appropriate physical and MAC layer protocols
- Understand the transport layer and security issues possible in Ad hoc and sensor networks.
- Be familiar with the OS used in Wireless Sensor Networks and build basic modules

TEXT BOOKS:

1. C. Siva Ram Murthy and B. S. Manoj, ―Ad Hoc Wireless Networks Architectures and Protocols‖, Prentice Hall, PTR, 2004. (UNIT I)
2. Holger Karl , Andreas willig, ―Protocol and Architecture for Wireless Sensor Networks‖, John wiley publication, Jan 2006.(UNIT II-V)

REFERENCES:

1. Feng Zhao, Leonidas Guibas, ―Wireless Sensor Networks: an information processing approach‖, Elsevier publication, 2004.
2. Charles E. Perkins, ―Ad Hoc Networking‖, Addison Wesley, 2000.
3. I.F. Akyildiz, W. Su, Sankarasubramaniam, E. Cayirci, ―Wireless sensor networks: a survey‖, computer networks, Elsevier, 2002, 394 - 422.

LIST OF ELECTIVES

ELECTIVE – III (SEMESTER VII)

ELECTIVE – III
SEMESTER VII

20152E76A ADVANCED WIRELESS COMMUNICATION L T P C
3 0 0 3

OBJECTIVES:

- To expose the students to the importance of improving capacity of wireless channel using MIMO
- To enable understanding of channel impairment mitigation using space-time block and Trellis codes
- To teach advanced MIMO system like layered space time codes, MU-MIMO System and MIMO-OFDM systems

UNIT I CAPACITY OF WIRELESS CHANNELS 9
The crowded spectrum, need for high data rate, MIMO systems – Array Gain, Diversity Gain, Data Pipes, Spatial MUX, MIMO System Model. MIMO System Capacity – channel known at the TX, Channel unknown to the TX – capacity of deterministic channels, Random channels and frequency selective channels.

UNIT II RADIO WAVE PROPAGATION 9
Radio wave propagation – Macroscopic fading- free space and out door, small scale fading Fading measurements – Direct pulse measurements, spread spectrum correlation channel sounding frequency domain channel sounding, Antenna Diversity – Diversity combining methods.

UNIT III SPACE TIME BLOCK CODES 9
Delay Diversity scheme, Alamoti space time code – Maximum likelihood decoding maximum ratio combining. Transmit diversity space time block codes for real signal constellation and complex signal constellation - decoding of STBC.

UNIT IV SPACE TIME TRELLIS CODES 9
Space time coded systems, space time code word design criteria, design of space time T C on slow fading channels, design of STTC on Fast Fading channels, performance analysis in slow and fast fading channels, effect of imperfect channel estimation and Antenna correlation on performance, comparison of STBC & STTC.

UNIT V LAYERED SPACE TIME CODES 9
LST transmitter – Horizontal and Vertical LST receiver – ML Rx, Zero forcing Rx; MMSE Rx, SIC Rx, ZF V-blast Rx- MMSE V-blast Rx, Iterative Rx - capacity of MIMO – OFDM systems – capacity of MIMO multi user systems.

TOTAL: 45 PERIODS

OUTCOMES:

The student should be able to:

- Comprehend and appreciate the significance and role of this course in the present contemporary world
- Apply the knowledge about the importance of MIMO in today's communication
- Appreciate the various methods for improving the data rate of wireless communication system

REFERENCES:

1. Mohinder Jankiraman, Space-time codes and MIMO systems, Artech House, Boston, London. www.artech house.com, ISBN 1-58053-865-7-2004
2. Paulraj Rohit Nabar, Dhananjay Gore, Introduction of space time wireless communication systems, Cambridge University Press, 2003.
3. David Tse and Pramod Viswanath, ―Fundamentals of Wireless Communication‖, Cambridge University Press, 2005.
4. Sergio Verdu ― Multi User Detection‖ Cambridge University Press, 1998.

ELECTIVE – III
SEMESTER VII

20152E76B COGNITIVE RADIO

L	T	P	C
3	0	0	3

OBJECTIVES:

The student should be made:

- To understand the evolving software defined radio and cognitive radio techniques and their essential functionalities
- To study the basic architecture and standard for cognitive radio
- To understand the physical, MAC and Network layer design of cognitive radio
- To expose the student to evolving applications and advanced features of cognitive radio

UNIT I INTRODUCTION TO SOFTWARE-DEFINED RADIO AND COGNITIVE RADIO 9

Evolution of Software Defined Radio and Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, radio frequency spectrum and regulations.

UNIT II COGNITIVE RADIO ARCHITECTURE 9

Cognition cycle – orient, plan, decide and act phases, Organization, SDR as a platform for Cognitive Radio – Hardware and Software Architectures, Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

UNIT III SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS 9

Introduction – Primary user detection techniques – energy detection, feature detection, matched filtering, cooperative detection and other approaches, Fundamental Tradeoffs in spectrum sensing, Spectrum Sharing Models of Dynamic Spectrum Access - Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

UNIT IV MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO 9

MAC for cognitive radios – Polling, ALOHA, slotted ALOHA, CSMA, CSMA / CA, Network layer design – routing in cognitive radios, flow control and error control techniques.

UNIT V ADVANCED TOPICS IN COGNITIVE RADIO 9

Overview of security issues in cognitive radios, auction based spectrum markets in cognitive radio networks, public safety and cognitive radio, cognitive radio for Internet of Things.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Gain knowledge on the design principles on software defined radio and cognitive radio
- Develop the ability to design and implement algorithms for cognitive radio spectrum sensing and dynamic spectrum access
- Build experiments and projects with real time wireless applications
- Apply the knowledge of advanced features of cognitive radio for real world applications

TEXT BOOKS:

1. Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, ―Cognitive Radio Communications and Networks‖, Academic Press, Elsevier, 2010. (Unit I to IV)
2. Huseyin Arslan (Ed.), ―Cognitive Radio, Software Defined Radio, and Adaptive Wireless Systems, Springer, 2007. (Unit V)

REFERENCES:

1. Bruce Fette, ―Cognitive Radio Technology‖, Newnes, 2006.
2. Kwang-Cheng Chen, Ramjee Prasad, ― Cognitive Radio Networks‖, John Wiley and Sons, 2009.
3. Ezio Biglieri, Professor Andrea J. Goldsmith, Dr Larry J. Greenstein, Narayan B. Mandayam, H. Vincent Poor, ―Principles of Cognitive Radio‖ , Cambridge University Press, 2012.

ELECTIVE – III
SEMESTER VII

20152E76C FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the global trends and development methodologies of various types of products and services
- To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology integrating the hardware, software, controls, electronics and mechanical systems
- To understand requirement engineering and know how to collect, analyze and arrive at requirements for new product development and convert them in to design specification
- To understand system modeling for system, sub-system and their interfaces and arrive at the optimum system specification and characteristics
- To develop documentation, test specifications and coordinate with various teams to validate and sustain up to the EoL (End of Life) support activities for engineering customer

UNIT I FUNDAMENTALS OF PRODUCT DEVELOPMENT 9

Global Trends Analysis and Product decision - Social Trends - Technical Trends- Economical Trends - Environmental Trends - Political/Policy Trends **- Introduction to Product Development Methodologies and Management -** Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies **-** Product Life Cycle – Product Development Planning and Management.

UNIT II REQUIREMENTS AND SYSTEM DESIGN 9

Requirement Engineering - Types of Requirements - Requirement Engineering – traceability Matrix and Analysis - Requirement Management - **System Design & Modeling -** Introduction to System Modeling - System Optimization - System Specification - Sub-System Design - Interface Design.

UNIT III DESIGN AND TESTING 9

Conceptualization - Industrial Design and User Interface Design - Introduction to Concept generation Techniques – **Challenges in Integration of Engineering Disciplines -** Concept Screening & Evaluation - **Detailed Design -** Component Design and Verification – **Mechanical, Electronics and Software Subsystems** - High Level Design/Low Level Design of S/W Program **-** Types of Prototypes, S/W Testing- Hardware Schematic, Component design, Layout and Hardware Testing – **Prototyping -** Introduction to Rapid Prototyping and Rapid Manufacturing - **System Integration, Testing, Certification and Documentation**

UNIT IV SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT 9

Introduction to Product verification processes and stages - Introduction to Product Validation processes and stages - Product Testing Standards and Certification - Product Documentation - **Sustenance -** Maintenance and Repair – Enhancements - **Product EoL -** Obsolescence Management – Configuration Management - EoL Disposal

UNIT V BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY 9

The Industry - Engineering Services Industry - Product Development in Industry versus Academia – **The IPD Essentials -** Introduction to Vertical Specific Product Development processes - Manufacturing/Purchase and Assembly of Systems - Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs - Intellectual Property Rights and Confidentiality – Security and Configuration Management.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Define, formulate and analyze a problem
- Solve specific problems independently or as part of a team
- Gain knowledge of the Innovation & Product Development process in the Business Context
- Work independently as well as in teams
- Manage a project from start to finish

TEXTBOOKS:

1. Book specially prepared by NASSCOM as per the MoU.
2. Karl T Ulrich and Stephen D Eppinger, "Product Design and Development", Tata McGraw Hill, Fifth Edition, 2011.
3. John W Newstorm and Keith Davis, "Organizational Behavior", Tata McGraw Hill, Eleventh Edition, 2005.

REFERENCES:

1. Hiriyappa B, ―Corporate Strategy – Managing the Business‖, Author House, 2013.
2. Peter F Drucker, ―People and Performance‖, Butterworth – Heinemann [Elsevier], Oxford, 2004.
3. Vinod Kumar Garg and Venkita Krishnan N K, ―Enterprise Resource Planning – Concepts‖, Second Edition, Prentice Hall, 2003.
4. Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013

20152E76D MACHINE LEARNING TECHNIQUES

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To learn the new approaches in machine learning
- To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION 9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT IV INSTANT BASED LEARNING 9

K- Nearest Neighbour Learning – Locally weighted Regression – Radial Bases Functions – Case Based Learning.

UNIT V ADVANCED LEARNING 9

Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning

TOTAL: 45 PERIODS

OUTCOMES:

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

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Apply specific supervised or unsupervised machine learning algorithm for a particular problem
- Analyse and suggest the appropriate machine learning approach for the various types of problem
- Design and make modifications to existing machine learning algorithms to suit an individual application
- Provide useful case studies on the advanced machine learning algorithms

TEXT BOOK:

1. Tom M. Mitchell, ―Machine Learning‖, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective‖, CRC Press, 2009.

ELECTIVE – III
SEMESTER VII

20152E76E ELECTRONICS PACKAGING AND TESTING L T P C
3 0 0 3

OBJECTIVE:

- To introduce and discuss various issues related to the system packaging

UNIT I OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING 9

Functions of an Electronic Package, Packaging Hierarchy, IC packaging: MEMS packaging, consumer electronics packaging, medical electronics packaging, Trends, Challenges, Driving Forces on Packaging Technology, Materials for Microelectronic packaging, Packaging Material Properties, Ceramics, Polymers, and Metals in Packaging, Material for high density interconnect substrates

UNIT II ELECTRICAL ISSUES IN PACKAGING 9

Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution, Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digital and RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance and Inductance fundamentals; Packaging roadmaps - Hybrid circuits - Resistive, Capacitive and Inductive parasitics

UNIT III CHIP PACKAGES 9

IC Assembly - Purpose, Requirements, Technologies, Wire bonding, Tape Automated Bonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Single chip packaging: functions, types, materials processes, properties, characteristics, trends. Multi chip packaging: types, design, comparison, trends. System – in - package (SIP); Passives: discrete, integrated, and embedded

UNIT IV PCB, SURFACE MOUNT TECHNOLOGY AND THERMAL CONSIDERATIONS 9

Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Micro via Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges. Thermal Management, Heat transfer fundamentals, Thermal conductivity and resistance, Conduction, convection and radiation – Cooling requirements

UNIT V TESTING 9

Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue – failures – thermo mechanically induced –electrically induced – chemically induced. Electrical Testing: System level electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability

TOTAL: 45 PERIODS

OUTCOMES:

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

- Give a comprehensive introduction to the various packaging types used along with the associated thermal, speed, signal and integrity power issues
- Enable design of packages which can withstand higher temperature, vibrations and shock
- Design of PCBs which minimize the EMI and operate at higher frequency
- Analyze the concepts of Testing and testing methods

TEXT BOOK:

1. Tummala, Rao R., Fundamentals of Microsystems Packaging, McGraw Hill, 2001

REFERENCES:

1. Blackwell (Ed), The electronic packaging handbook, CRC Press, 2000.
2. Tummala, Rao R, Microelectronics packaging handbook, McGraw Hill, 2008.
3. Bosshart, Printed Circuit Boards Design and Technology, TataMcGraw Hill, 1988.
4. R.G. Kaduskar and V.B.Baru, Electronic Product design, Wiley India, 2011

5. R.S.Khandpur, Printed Circuit Board, Tata McGraw Hill, 2005
6. Recent literature in Electronic Packaging
7. Michael L. Bushnell &Vishwani D. Agrawal,‖ Essentials of Electronic Testing for Digital, memory & Mixed signal VLSI Circuits‖, Kluwer Academic Publishers.2000.
8. M. Abramovici, M. A. Breuer, and A.D. Friedman, ―Digital System Testing and Testable Design‖, Computer Science Press,1990

ELECTIVE – III
SEMESTER VII

20152E76F MIXED SIGNAL IC DESIGN L T P C
3 0 0 3

OBJECTIVES:
The student should be made to:
- Study the mixed signal of submicron CMOS circuits
- Understand the various integrated based filters and topologies
- Learn the data converters architecture, modeling and signal to noise ratio
- Study the integrated circuit of oscillators and PLLs

UNIT I SUBMICRON CMOS CIRCUIT DESIGN 9
Submicron CMOS: Overview and Models, CMOS process flow, Capacitors and Resistors. Digital circuit design: The MOSFET Switch, Delay Elements, An Adder. Analog Circuit Design: Biasing, Op-Amp Design, Circuit Noise.

UNIT II INTEGRATOR BASED CMOS FILTERS 9
Integrator Building Blocks- low pass filter, Active RC integrators, MOSFET-C Integrators, g_m-C integrators, Discrete time integrators. Filtering Topologies: The Bilinear transfer function, The Biquadratic transfer function, Filters using Noise shaping.

UNIT III DATA CONVERTER ARCHITECTURES 9
DAC Architectures- Resistor string, R-2R ladder Networks, Current Steering, Charge Scaling DACs, Cyclic DAC, and Pipeline DAC. ADC Architectures- Flash, Two-step flash ADC, Pipeline ADC, Integrating ADC‘s, Successive Approximation ADC.

UNIT IV DATA CONVERTER MODELING AND SNR 9
Sampling and Aliasing: A modeling approach, Impulse sampling, The sample and Hold, Quantization noise. Data converter SNR: An overview, Clock Jitter, Improving SNR using Averaging, Decimating filter for ADCs, Interpolating filter for DACs, Band pass and High pass sinc filters - Using feedback to improve SNR.

UNIT V OSCILLATORS AND PLL 9
LC oscillators, Voltage Controlled Oscillators. Simple PLL, Charge pumps PLLs, Non ideal effects in PLLs, Delay Locked Loops.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, student should be able to
- Apply the concepts for mixed signal MOS circuit.
- Analyze the characteristics of IC based CMOS filters.
- Design of various data converter architecture circuits.
- Analyze the signal to noise ratio and modeling of mixed signals.
- Design of oscillators and phase lock loop circuit.

REFERENCES:

1. CMOS Mixed Signal Circuit Design by R.Jacob Baker, Wiley India, IEEE Press, reprint 2008.
2. CMOS Circuit Design, Layout and Simulation by R.Jacob Baker, Wiley India, IEEE Press, Second Edition, reprint 2009.
3. Design of Analog CMOS Integrated Circuits by Behzad Razavi, McGraw Hill, 33rd Re-print, 2016.

ELECTIVE – III
SEMESTER VII

20152E76G 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 Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

REFERENCES:

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

SEMESTER VII

20152L77 EMBEDDED LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

The student should be made to:

- Learn the working of ARM processor
- Understand the Building Blocks of Embedded Systems
- Learn the concept of memory map and memory interface
- Write programs to interface memory, I/Os with processor
- Study the interrupt performance

LIST OF EXPERIMENTS:

1. Study of ARM evaluation system
2. Interfacing ADC and DAC.
3. Interfacing LED and PWM.
4. Interfacing real time clock and serial port.
5. Interfacing keyboard and LCD.
6. Interfacing EPROM and interrupt.
7. Mailbox.
8. Interrupt performance characteristics of ARM and FPGA.
9. Flashing of LEDS.
10. Interfacing stepper motor and temperature sensor.
11. Implementing zigbee protocol with ARM.

TOTAL: 60 PERIODS

OUTCOMES:

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

- Write programs in ARM for a specific Application
- Interface memory, A/D and D/A convertors with ARM system
- Analyze the performance of interrupt
- Write program for interfacing keyboard, display, motor and sensor.
- Formulate a mini project using embedded system

SEMESTER VII

20152L78 ADVANCED COMMUNICATION LABORATORY

	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

OBJECTIVES:

The student should be made to:

- Understand the working principle of optical sources, detector, fibers
- Develop understanding of simple optical communication link
- Understand the measurement of BER, Pulse broadening
- Understand and capture an experimental approach to digital wireless communication
- Understand actual communication waveforms that will be sent and received across wireless channel

LIST OF OPTICAL EXPERIMENTS

1. Measurement of connector, bending and fiber attenuation losses.
2. Numerical Aperture and Mode Characteristics of Fibers.
3. DC Characteristics of LED and PIN Photo diode.
4. Fiber optic Analog and Digital Link Characterization - frequency response(analog), eye diagram and BER (digital)

LIST OF WIRELESS COMMUNICATION EXPERIMENTS

1. Wireless Channel Simulation including fading and Doppler effects
2. Simulation of Channel Estimation, Synchronization & Equalization techniques
3. Analysing Impact of Pulse Shaping and Matched Filtering using Software Defined Radios
4. OFDM Signal Transmission and Reception using Software Defined Radios

LIST OF MICROWAVE EXPERIMENTS

1. VSWR and Impedance Measurement and Impedance Matching
2. Characterization of Directional Couplers, Isolators, Circulators
3. Gunn Diode Characteristics
4. Microwave IC – Filter Characteristics

TOTAL: 60 PERIODS

OUTCOMES:

On completion of this lab course, the student would be able to

- Analyze the performance of simple optical link by measurement of losses and Analyzing the mode characteristics of fiber
- Analyze the Eye Pattern, Pulse broadening of optical fiber and the impact on BER
- Estimate the Wireless Channel Characteristics and Analyze the performance of Wireless Communication System
- Understand the intricacies in Microwave System design

LIST OF ELECTIVES

ELECTIVE – IV (SEMESTER VIII)

ELECTIVE – IV
SEMESTER VIII

20152E81A ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the basic concepts of Electromagnetic Interference
- To teach the importance of Electromagnetic Compatible designs
- To explain the existing standards for Electromagnetic Compatibility

UNIT I EMI/EMC CONCEPTS 9

EMI-EMC definitions; Sources and Victims of EMI; Conducted and Radiated EMI Emission and Susceptibility; Case Histories; Radiation Hazards to humans.

UNIT II EMI COUPLING PRINCIPLES 9

Conducted, radiated and transient coupling; Common ground impedance coupling; Common mode and ground loop coupling; Differential mode coupling; Near field cable to cable coupling; Field to cable coupling; Power mains and Power supply coupling; Transient EMI, ESD.

UNIT III EMI CONTROL 9

Shielding; EMI Filters; Grounding; Bonding; Isolation transformer; Transient suppressors; EMI Suppression Cables.

UNIT IV EMC DESIGN FOR CIRCUITS AND PCBS 9

Noise from Relays and Switches; Nonlinearities in Circuits; Cross talk in transmission line and cross talk control; Component selection and mounting; PCB trace impedance; Routing; Power distribution decoupling; Zoning; Grounding; VIAs; Terminations.

UNIT V EMI MEASUREMENTS AND STANDARDS 9

Open area test site; TEM cell; EMI test shielded chamber and shielded ferrite lined anechoic chamber; Line impedance stabilization networks; EMI Rx and spectrum analyzer; Civilian standards - CISPR, FCC, IEC, EN; Military standards-MIL461E/462.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the various types and mechanisms of Electromagnetic Interference
- Propose a suitable EMI mitigation technique
- Describe the various EMC Standards and methods to measure them

TEXT BOOKS:

1. V.P.Kodali, ―Engineering EMC Principles, Measurements and Technologies‖, IEEE Press, Newyork, 1996.(Unit I – V)
2. Henry W.Ott., Noise Reduction Techniques in Electronic Systems‖, A Wiley Inter Science
3. Publications, John Wiley and Sons, Newyork, 1988. (Unit – IV)

REFERENCES:

1. C.R.Paul,‖Introduction to Electromagnetic Compatibility‖ , John Wiley and Sons, Inc, 1992.
2. Bemhard Keiser, ―Principles of Electromagnetic Compatibility‖, 3rd Ed, Artech house, Norwood, 1986.
3. Don R. J.White Consultant Incorporate, ―Handbook of EMI/EMC‖, Vol I-V, 1988.

ELECTIVE – IV
SEMESTER VIII

20152E81B **LOW POWER SoC DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:
The student should be made to:
- Identify sources of power in an IC.
- Understand basic principle of System on Chip design
- Learn optimization of power in combinational and sequential logic machines for SoC Design
- Identify suitable techniques to reduce the power dissipation and design circuits with low power dissipation.

UNIT I POWER CONSUMPTION IN CMOS 9
Physics of power dissipation in CMOS FET devices – Hierarchy of limits of power – Sources of power consumption – Static Power Dissipation, Active Power Dissipation - Designing for Low Power, Circuit Techniques for Leakage Power Reduction - Basic principle of low power design, Logic level power optimization – Circuit level low power design.

UNIT II SYSTEM-ON-CHIP DESIGN 9
System-on-Chip Concept, Design Principles in SoC Architecture, SoC Design Flow, Platform-based and IP based SoC Designs, Basic Concepts of Bus-Based Communication Architectures. High performance algorithms for ASICs/ SoCs as case studies – Canonic Signed Digit Arithmetic, KCM, Distributed Arithmetic, High performance digital filters for sigma-delta ADC

UNIT III POWER OPTIMIZATION OF COMBINATIONAL AND SEQUENTIAL LOGIC MACHINES FOR SOC 9
Introduction to Standard Cell-Based Layout – Simulation - Combinational Network Delay - Logic and interconnect Design - Power Optimization - Switch Logic Networks. Introduction - Latches and Flip-Flops - Sequential Systems and Clocking Disciplines - Sequential System Design - Power Optimization - Design Validation - Sequential Testing.

UNIT IV DESIGN OF LOW POWER CIRCUITS FOR SUB SYSTEM ON A SOC 9
Subsystem Design Principles - Combinational Shifters – Adders – ALUs – Multipliers – High Density Memory – Field Programmable Gate Arrays - Programmable Logic Arrays - Computer arithmetic techniques for low power system – low voltage low power static Random access and dynamic Random access memories, low power clock, Inter connect and layout design

UNIT V FLOOR PLANNING 9
Floor-planning Methods – Block Placement & Channel Definition - Global Routing - switchbox Routing - Power Distribution - Clock Distributions - Floor-planning Tips - Design Validation - Off-Chip Connections – Packages, The I/O Architecture - PAD Design

TOTAL:45 PERIODS

OUTCOME:
At the end of the course, the student should be able to:
- Analyze and design low-power VLSI circuits using different circuit technologies for system on chip design

TEXT BOOKS:

1. J.Rabaey, ―Low Power Design Essentials (Integrated Circuits and Systems)‖, Springer, 2009
2. Wayne Wolf, ―Modern VLSI Design – System – on – Chip Design‖, Prentice Hall, 3rd Edition, 2008.

REFERENCES:

1. J.B.Kuo & J.H.Lou, ―Low-voltage CMOS VLSI Circuits‖, Wiley, 1999.

2. A.Bellaowar & M.I.Elmasry,‖Low power Digital VLSI Design, Circuits and Systems‖, Kluwer, 1996.
3. Wayne Wolf, ―Modern VLSI Design – IP based Design‖, Prentice Hall, 4th Edition, 2008.
4. M.J.S. Smith : Application Specific Integrated Circuits, Pearson, 2003
5. Sudeep Pasricha and Nikil Dutt, On-Chip Communication Architectures System on Chip Interconnect, Elsevier, 2008
6. Recent literature in Low Power VLSI Circuits.
7. Recent literature in Design of ASICs

ELECTIVE – IV
SEMESTER VIII

20152E81C **PHOTONIC NETWORKS** **L T P C**
3 0 0 3

OBJECTIVES:

- To enable the student to understand the importance of the backbone infrastructure for our present and future communication needs and familiarize them with the architectures and the protocol stack in use
- To enable the student to understand the differences in the design of data plane and the control plane and the routing, switching and the resource allocation methods and the network management and protection methods in vogue
- To expose the student to the advances in networking and switching domains and the future trends

UNIT I OPTICAL SYSTEM COMPONENTS 9
Light Propagation in optical fibers – Loss & bandwidth, System limitations, Nonlinear effects; Solitons; Optical Network Components – Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Switches, Wavelength Converters.

UNIT II OPTICAL NETWORK ARCHITECTURES 9
Introduction to Optical Networks; SONET / SDH, Metropolitan-Area Networks, Layered Architecture; Broadcast and Select Networks – Topologies for Broadcast Networks, Media-Access Control Protocols, Wavelength Routing Architecture.

UNIT III WAVELENGTH ROUTING NETWORKS 9
The optical layer, Optical Network Nodes, Routing and wavelength assignment, Traffic Grooming in Optical Networks, Architectural variations- Linear Light wave networks, Logically Routed Networks.

UNIT IV PACKET SWITCHING AND ACCESS NETWORKS 9
Photonic Packet Switching – OTDM, Multiplexing and Demultiplexing, Synchronization, Broadcast OTDM networks, Switch-based networks, Contention Resolution Access Networks – Network Architecture overview, Optical Access Network Architectures and OTDM networks.

UNIT V NETWORK DESIGN AND MANAGEMENT 9
Transmission System Engineering – System model, Power penalty - transmitter, receiver, Optical amplifiers, crosstalk, dispersion, Wavelength stabilization, Overall design considerations, Control and Management – Network management functions, Configuration management, Performance management, Fault management, Optical safety, Service interface.

TOTAL: 45 PERIODS

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

- Use the backbone infrastructure for our present and future communication needs
- Analyze the architectures and the protocol stack
- Compare the differences in the design of data plane, control plane, routing, switching, resource allocation methods, network management and protection methods in vogue

REFERENCES:

1. Rajiv Ramaswami and Kumar N. Sivarajan, ―Optical Networks: A Practical Perspective‖, Harcourt Asia Pte Ltd., Second Edition 2004.
2. C. Siva Ram Moorthy and Mohan Gurusamy, ―WDM Optical Networks: Concept, Design and Algorithms‖, Prentice Hall of India, Ist Edition, 2002.
3. P.E. Green, Jr., ―Fiber Optic Networks‖, Prentice Hall, NJ, 1993.
4. Biswanath Mukherjee, ―Optical WDM Networks‖, Springer Series, 2006.

ELECTIVE – IV
SEMESTER VIII

20152E81D **COMPRESSIVE SENSING** **L T P C**
3 0 0 3

OBJECTIVES:

- To present the basic theory and ideas showing when it is possible to reconstruct sparse or nearly sparse signals from undersampled data
- To expose students to recent ideas in modern convex optimization allowing rapid signal recovery
- To give students a sense of real time applications that might benefit from compressive sensing ideas

UNIT I INTRODUCTION TO COMPRESSED SENSING 9
Introduction; Motivation; Mathematical Background; Traditional Sampling; Traditional Compression; Conventional Data Acquisition System; Drawbacks of Transform coding; Compressed Sensing (CS).

UNIT II SPARSITY AND SIGNAL RECOVERY 9
Signal Representation; Basis vectors; Sensing matrices; Restricted Isometric Property; Coherence; Stable recovery; Number of measurements.

UNIT III RECOVERY ALGORITHMS 9
Basis Pursuit algorithm: L1 minimization; Matching pursuit: Orthogonal Matching Pursuit(OMP), Stagewise OMP, Regularized OMP, Compressive Sampling Matching Pursuit (CoSaMP); Iterative Thresholding algorithm: Hard thresholding, Soft thresholding; Model based : Model based CoSaMP, Model based HIT.

UNIT IV COMPRESSIVE SENSING FOR WSN 9
Basics of WSN; Wireless Sensor without Compressive Sensing; Wireless Sensor with Compressive Sensing; Compressive Wireless Sensing: Spatial compression in WSNs, Projections in WSNs, Compressed Sensing in WSNs.

UNIT V APPLICATIONS OF COMPRESSIVE SENSING 9
Compressed Sensing for Real-Time Energy-Efficient Compression on Wireless Body Sensor Nodes; Compressive sensing in video surveillance; An Application of Compressive Sensing for Image Fusion; Single-Pixel Imaging via Compressive Sampling.

TOTAL:45 PERIODS

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

- Appreciate the motivation and the necessity for compressed sensing technology.
- Design a new algorithm or modify an existing algorithm for different application areas in wireless sensor network.

TEXT BOOKS:

1. Radha S, Hemalatha R, Aasha Nandhini S, ―Compressive Sensing for Wireless Communication: Challenges and Opportunities‖, River publication, 2016. (UNIT I-V)
2. Mark A. Davenport, Marco F. Duarte, Yonina C. Eldar and Gitta Kutyniok, ―Introduction to Compressed Sensing,‖ in Compressed Sensing: Theory and Applications, Y. Eldar and G.
3. Kutyniok, eds., Cambridge University Press, 2011 (UNIT I)

REFERENCES:

1. Duarte, M.F.; Davenport, M.A.; Takhar, D.; Laska, J.N.; Ting Sun; Kelly, K.F.; Baraniuk, R.G.; "Single-Pixel Imaging via Compressive Sampling," Signal Processing Magazine, IEEE, vol.25, no.2, pp.83-91, March 2008.

2. Tao Wan.; Zengchang Qin.; , ―An application of compressive sensing for image fusion‖, CIVR '10 Proceedings of the ACM International Conference on Image and Video Retrieval, Pages 3-9.
3. H. Mamaghanian , N. Khaled , D. Atienza and P. Vandergheynst "Compressed sensing for real-time energy-efficient ecg compression on wireless body sensor nodes", IEEE Trans. Biomed. Eng., vol. 58, no. 9, pp.2456 -2466 2011.
4. Mohammadreza Balouchestani.; Kaamran Raahemifar.; and Sridhar Krishnan.;, ―COMPRESSED SENSING IN WIRELESS SENSOR NETWORKS: SURVEY‖ , Canadian Journal on Multimedia and Wireless Networks Vol. 2, No. 1, February 2011.

ELECTIVE – IV
SEMESTER VIII

20152E81E DIGITAL IMAGE PROCESSING **L T P C**
3 0 0 3

OBJECTIVES:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Understand the restoration concepts and filtering techniques.
- Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXT BOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, ‗Digital Image Processing', Pearson, Third Edition, 2010.
2. Anil K. Jain, ‗Fundamentals of Digital Image Processing', Pearson, 2002.

REFERENCES
1. Kenneth R. Castleman, _Digital Image Processing‘, Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, _Digital Image Processing using MATLAB‘, Pearson Education, Inc., 2011.
3. D,E. Dudgeon and RM. Mersereau, _Multidimensional Digital Signal Processing‘, Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, _Digital Image Processing‘, John Wiley, New York, 2002
5. Milan Sonka et al _Image processing, analysis and machine vision‘, Brookes/Cole, Vikas Publishing House, 2nd edition, 1999.

LIST OF ELECTIVES

ELECTIVE – V (SEMESTER VIII)

ELECTIVE – V
SEMESTER VIII

20152E82A VIDEO ANALYTICS **L T P C**
3 0 0 3

OBJECTIVES:
The student should be made:
- To understand the need for video Analytics
- To understand the basic configuration of video analytics
- To understand the functional blocks of a video analytic system
- To get exposed to the various applications of video analytics

UNIT I VIDEO ANALYTIC COMPONENTS 9
Need for Video Analytics-Overview of video Analytics- Foreground extraction- Feature extraction classifier - Preprocessing- edge detection- smoothening- Feature space-PCA-FLD-SIFT features

UNIT II FOREGROUND EXTRACTION 9
Background estimation- Averaging- Gaussian Mixture Model- Optical Flow based- Image Segmentation-Region growing- Region splitting-Morphological operations- erosion-Dilation-Tracking in a multiple camera environment

UNIT III CLASSIFIERS 9
Neural networks (back propagation) - Deep learning networks- Fuzzy Classifier- Bayesian classifier-HMM based classifier

UNIT IV VIDEO ANALYTICS FOR SECURITY 9
Abandoned object detection- human behavioral analysis -human action recognition -perimeter security - crowd analysis and prediction of crowd congestion

UNIT V VIDEO ANALYTICS FOR BUSINESS INTELLIGENCE & TRAFFIC MONITIRING AND ASSISTANCE 9
Customer behavior analysis - people counting- Traffic rule violation detection- traffic congestion identification for route planning- driver assistance- lane change warning

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
- Design video analytic algorithms for security applications
- Design video analytic algorithms for business intelligence
- Design custom made video analytics system for the given target application

REFERENCES:

1. Graeme A. Jones (Editor), Nikos Paragios (Editor), Carlo S. Regazzoni (Editor) Video-Based Surveillance Systems: Computer Vision and Distributed Processing, Kluwer academic publisher, 2001
2. Nilanjan Dey (Editor), Amira Ashour (Editor) and Suvojit Acharjee (Editor), Applied Video Processing in Surveillance and Monitoring Systems (IGI global) 2016

3. Zhihao Chen (Author), Ye Yang (Author), Jingyu Xue (Author), Liping Ye (Author), Feng Guo (Author), The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite, CreateSpace Independent Publishing Platform, 2014
4. Caifeng Shan (Editor), Fatih Porikli (Editor), Tao Xiang (Editor), Shaogang Gong (Editor) Video Analytics for Business Intelligence, Springer, 2012

ELECTIVE – V
SEMESTER VIII

20152E82B DSP ARCHITECTURE AND PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

The objective of this course is to provide knowledge on:

- Basics on Digital Signal Processors
- Programmable DSP‘s Architecture, On-chip Peripherals and Instruction set
- Programming for signal processing applications
- Advanced Programmable DSP Processors

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

Introduction to Programmable DSPs, Architectural Features of PDSPs - Multiplier and Multiplier accumulator – Modified Bus Structures and Memory access – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining – Special Addressing modes in P-DSPs – On chip Peripherals, Applications of Programmable DSPs.

UNIT II TMS320C5X PROCESSOR 9

Architecture of C5X Processor – Addressing modes – Assembly language Instructions - Pipeline structure, On-chip Peripherals – Block Diagram of DSP starter kit (DSK) – Software Tools, DSK on-board peripherals, Application Programs for processing real time signals.

UNIT III TMS320C6X PROCESSOR 9

Architecture of the C6x Processor - Instruction Set – Addressing modes, Assembler directives, On-chip peripherals, DSP Development System: DSP Starter Kit - Code Composer Studio - Support Files – Introduction to AIC23 codec and other on-board peripherals, Real-Time Programming Examples for Signals and Noise generation, Frequency analysis, Filter design.

UNIT IV ADSP PROCESSORS 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT V ADVANCED PROCESSORS 9

Study of TI‘s advanced processors - TMS320C674x and TMS320C55x DSPs, ADSP‘s Blackfin and SigmaDSP Processors, NXP‘s DSP56Fxx Family of DSP Processors, Comparison of the features of TI, ADSP and NXP DSP family processors.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze the concepts of Digital Signal Processors
- Demonstrate their ability to program the DSP processor for signal processing applications
- Discuss, compare and select the suitable Advanced DSP Processors for real-time signal processing applications

REFERENCES:

1. B. Venkataramani and M. Bhaskar, ―Digital Signal Processors – Architecture, Programming and Applications‖ – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. Avtar Singh and S. Srinivasan, Digital Signal Processing – Implementations using DSP Microprocessors with Examples from TMS320C54xx, Cengage Learning India Private Limited, Delhi 2012.

3. Rulph Chassaing and Donald Reay, Digital Signal Processing and Applications with the C6713 and C6416 DSK, John Wiley & Sons, Inc., Publication, 2012 (Reprint).
4. User guides Texas Instruments, Analog Devices and NXP.

ELECTIVE – V
SEMESTER VIII

20152E82C SATELLITE COMMUNICATION

	L	T	P	C
	3	0	0	3

OBJECTIVES:
The student should be made to:
- Understand the basics of satellite orbits
- Understand the satellite segment and earth segment
- Analyze the various methods of satellite access
- Understand the applications of satellites
- Understand the basics of satellite Networks

UNIT I SATELLITE ORBITS 9
Kepler‟s Laws, Newton‟s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility – eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

UNIT II SPACE SEGMENT 9
Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders-The Antenna Subsystem.

UNIT III SATELLITE LINK DESIGN 9
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.

UNIT IV SATELLITE ACCESS AND CODING METHODS 9
Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.

UNIT V SATELLITE APPLICATIONS 9
INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH).

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student would be able to:
- Analyze the satellite orbits
- Analyze the earth segment and space segment
- Analyze the satellite Link design
- Design various satellite applications

TEXT BOOKS:
1. Dennis Roddy, ―Satellite Communication‖, 4th Edition, Mc Graw Hill International, 2006.
2. Timothy,Pratt,Charles,W.Bostain,JeremyE.Allnutt,"SatelliteCommunication‖, 2nd Edition, Wiley Publications, 2002

REFERENCES:
1. Wilbur L.Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, ―Satellite Communication Systems Engineering‖, Prentice Hall/Pearson, 2007.
2. N.Agarwal, ―Design of Geosynchronous Space Craft‖, Prentice Hall, 1986.

3. Bruce R. Elbert, ―The Satellite Communication Applications‖, Hand Book, Artech House Bostan London, 1997.
4. Tri T. Ha, ―Digital Satellite Communication‖, II nd edition, 1990.
5. Emanuel Fthenakis, ―Manual of Satellite Communications‖, Mc Graw Hill Book Co., 1984.
6. Robert G. Winch, ―Telecommunication Trans Mission Systems‖, Mc Graw-Hill Book Co., 1983.
7. Brian Ackroyd, ―World Satellite Communication and earth station Design‖, BSP Professional Books, 1990.
8. G.B.Bleazard, ―Introducing Satellite communications―, NCC Publication, 1985.
9. M.Richharia, ―Satellite Communication Systems-Design Principles‖, Macmillan 2003.

ELECTIVE – V
SEMESTER VIII

20152E82D **SOFT COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory -Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS 9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV GENETIC ALGORITHMS 9

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators -Convergence of Genetic Algorithm.

UNIT V HYBRID SYSTEMS 9

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply suitable soft computing techniques for various applications.
- Integrate various soft computing techniques for complex problems.

TEXT BOOKS:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt.Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt.Ltd., 2017.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2002.
2. Kwang H.Lee, ―First course on Fuzzy Theory and Applications‖, Springer, 2005.
3. George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖ Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques‖, Addison Wesley, 2003.

ELECTIVE – V
SEMESTER VIII

20152E82E PRINCIPLES OF SPEECH PROCESSING

L	T	P	C
3	0	0	3

OBJECTIVES:
The student should be made:

- To understand the speech production mechanism and the various speech analysis techniques and speech models
- To understand the speech compression techniques
- To understand the speech recognition techniques
- To know the speaker recognition and text to speech synthesis techniques

UNIT I SPEECH SIGNAL CHARACTERISTICS & ANALYSIS 11

Speech production process - speech sounds and features- - Phonetic Representation of Speech -- representing= speech in time and frequency domains - Short-Time Analysis of Speech - Short-Time Energy and Zero-Crossing Rate - Short-Time Autocorrelation Function - Short-Time Fourier Transform (STFT) - Speech Spectrum - Cepstrum - Mel-Frequency Cepstrum Coefficients - Hearing and Auditory Perception - Perception of Loudness - Critical Bands - Pitch Perception

UNIT II SPEECH COMPRESSION 12

Sampling and Quantization of Speech Vector Quantization- (PCM) - Adaptive differential PCM - Delta Modulation -Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT III SPEECH RECOGNITION 12

LPC for speech recognition- Hidden Markov Model (HMM)- training procedure for HMM- subword unit model based on HMM- language models for large vocabulary speech recognition - Overall recognition system based on subword units - Context dependent subword units- Semantic post processor for speech recognition

UNIT IV SPEAKER RECOGNITION 5

Acoustic parameters for speaker verification- Feature space for speaker recognition-similarity measures-Text dependent speaker verification-Text independent speaker verification techniques

UNIT V SPEAKER RECOGNITION AND TEXT TO SPEECH SYNTHESIS 5

Text to speech synthesis(TTS)-Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody

TOTAL: 45 PERIODS

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

- Design speech compression techniques
- Configure speech recognition techniques
- Design speaker recognition systems
- Design text to speech synthesis systems

TEXT BOOKS:

1. L. R. Rabiner and R. W. Schafer, Introduction to Digital Signal Processing, Foundations and Trendsin Signal Processing Vol. 1, Nos. 1–2 (2007) 1–194
2. Ben Gold and Nelson Morgan ―Speech and Audio signal processing- processing and perception of speech and music‖, John Wiley and sons 2006

REFERENCES

1. Lawrence Rabiner, Biiing and– Hwang Juang and B.Yegnanarayana ―Fundamentals of Speech Recognition‖, Pearson Education, 2009

2. Claudio Becchetti and Lucio Prina Ricotti, ―Speech Recognition‖, John Wiley and Sons, 1999
3. Donglos O shanhnessy ―Speech Communication: Human and Machine ―, 2nd Ed. University press 2001.

ELECTIVE – V
SEMESTER VIII

20152E82F FUNDAMENTALS OF NANO SCIENCE

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION **8**

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

UNIT II GENERAL METHODS OF PREPARATION **9**

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

UNIT III NANOMATERIALS **12**

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

UNIT IV CHARACTERIZATION TECHNIQUES **9**

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

UNIT V APPLICATIONS **7**

Nano InfoTech: Information storage- Nano computer, molecular switch, super chip, nanocrystal, Nano biotechnology: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targeted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nano sensors, nano crystalline silver for bacterial inhibition, Nanoparticles for sun barrier products - In Photostat, printing, solar cell, battery.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

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

SEMESTER VIII

201AGPE **PROFESSIONAL ETHICS AND HUMAN VALUES**

L	T	P	C
0	0	0	2

OBJECTIVE:

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

UNIT I HUMAN VALUES

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

UNIT II ENGINEERING ETHICS

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

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

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

UNIT V GLOBAL ISSUES

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

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

1 Charles B. Fleddermann, —Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2 Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, —Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.
3 John R Boatright, —Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003
4 Edmund G Seebauer and Robert L Barry, —Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.
5 Laura P. Hartman and Joe Desjardins, —Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6 World Community Service Centre, _ Value Education', Vethathiri publications, Erode, 2011.

Web sources:

www.onlineethics.org www.nspe.org www.globalethics.org www.ethics.org

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SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT

OF

COMPUTER SCIENCE AND ENGINEERING

PROGRAM HANDBOOK

B.TECH – FULL TIME

[REGULATION 2020]

Human value

Environment and sustainability

Gender Sensitization

Professional Ethics

COURSE STRUCTURE

I - VIII SEMESTERS CURRICULUM AND SYLLABI

B.TECH (FT) CSE [REGULATION 2020]

SEMESTER I

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S11	Communicative English	2	0	0	2
2.	20148S12	Engineering Mathematics I	3	1	0	4
3.	20149S13	Engineering Physics	2	1	0	3
4.	20149S14	Engineering Chemistry	2	1	0	3
5.	20154S15	Engineering Graphics	1	0	4	3
6.	20150S16	Problem Solving and Basics of Python Programming	3	0	0	3
PRACTICAL						
7.	20150L17	Problem Solving and Basics of Python Programming Laboratory	0	0	4	2
8.	20149L18	Physics and Chemistry Laboratory	0	0	4	2
TOTAL			13	03	12	22
AUDIT COURSE						
1.	201AGIT	Induction Training Programme				2

SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20147S21	Technical English	2	0	0	2
2	20148S22	Engineering Mathematics – II	3	1	0	4
3	20149S23A	Physics for Information Science	3	0	0	3
4	20149S24A	Environmental Science And Engineering	3	0	0	3
5	20153S25A	Basic Electrical, Electronics And Measurement Engineering	2	1	0	3
6	20150S26A	Programming in C	4	0	0	4
PRACTICAL						
7	20154L27	Engineering Practices Laboratory	1	0	4	3
8	20150L28A	C Programming Laboratory	0	0	4	2
		TOTAL	18	02	08	24
AUDIT COURSE						
1	201AGIC	Indian Constitution				2
SOFT SKILL COURSE						
1	201ASBE	Basic Behavioral Etiquette				2

SEMESTER III

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148S31A	Discrete Mathematics	3	1	0	4
2.	20150S32	Digital Principles and System Design	4	0	0	4
3.	20150C33	Data Structures	3	0	0	3
4.	20150C34	Object Oriented Programming	3	0	0	3
5.	20150S35	Communication Engineering	3	0	0	3
PRACTICAL						
6.	20150L36	Data Structures Laboratory	0	0	4	2

7.	20150L37	Object Oriented Programming Laboratory	0	0	4	2
8.	20150L38	Digital Systems Laboratory	0	0	4	2
9.	20150L39	Interpersonal Skills/Listening &Speaking	0	0	2	1
		TOTAL	16	1	14	24
		AUDIT COURSE				
1.	201AGGS	Introduction to Gender studies				2

SEMESTER IV

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	20148S41A	Probability and Queuing Theory	3	1	0	4
2.	20150C42	Computer Architecture	3	0	0	3
3.	20150C43	Database Management Systems	3	0	0	3
4.	20150C44	Design and Analysis of Algorithms	3	0	0	3
5.	20150C45	Operating Systems	3	0	0	3
6.	20150C46	Software Engineering	3	0	0	3
		PRACTICAL				
7.	20150L47	Database Management Systems Laboratory	0	0	4	2
8.	20150L48	Operating Systems Laboratory	0	0	4	2
9.	20150L49	Advanced Reading and Writing	0	0	2	1
		TOTAL	18	1	10	24
		AUDIT COURSE				
1.	201AGCE	Community Engagement				2
		SOFT SKILL COURSE				
1.	201ASGS	Technical, General Aptitude and Skill set Development				2

SEMESTER V

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	20148S51A	Algebra and Number Theory	3	1	0	4
2.	20150C52	Computer Networks	3	0	0	3
3.	20150C53	Microprocessors and Microcontrollers	3	0	0	3
4.	201_ _OE54__	Open Elective – I	3	0	0	3
5.	20150C55	Theory of Computation	2	1	0	3
6.	20150C56	Object Oriented Analysis and Design	3	0	0	3

PRACTICAL						
7.	20150L57	Microprocessors and Microcontrollers Laboratory	0	0	4	2
8.	20150L58	Object Oriented Analysis and Design Laboratory	0	0	4	2
9.	20150L59	Networks Laboratory	0	0	4	2
		TOTAL	17	02	12	25
AUDIT COURSE						
1.	201AGIE	Innovation and Entrepreneurship				2

SEMESTER VI

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20150C61	Internet Programming	3	0	0	3
2.	20150C62	Artificial Intelligence	3	0	0	3
3.	20150C63	Mobile Computing	3	0	0	3
4.	20150C64	Compiler Design	3	1	0	4
5.	20150C65	Distributed Systems	3	0	0	3
6.	20150E66__	Elective - I	3	0	0	3
PRACTICAL						
7.	20150L61	Internet Programming Laboratory	0	0	4	2
8.	20150L62	Mobile Application Development Laboratory	0	0	4	2
9.	20150MP63	Mini Project	0	0	4	2
10.	20150L64	Professional Communication	0	0	2	1
		TOTAL	18	02	14	26
SOFT SKILL COURSE						
1.	201ASTT	Technical Training				2

SEMESTER VII

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20150S71	Principles of Management	3	0	0	3
2.	20150C72	Cryptography and Network Security	3	0	0	3
3.	20150C73	Cloud Computing	3	0	0	3
4.	201_ _OE74__	Open Elective – II	3	0	0	3
5.	20150E75__	Elective – II	3	0	0	3
6.	20150E76__	Elective – III	3	0	0	3
PRACTICAL						

7.	20150L77	Cloud Computing Laboratory	0	0	4	2
8.	20150L78	Security Laboratory	0	0	4	2
		TOTAL	**18**	0	**8**	**22**

SEMESTER VIII

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	20150E81__	Elective – IV	3	0	0	3
2.	20150E82__	Elective – V	3	0	0	3
		PRACTICAL				
3.	20150P83	Project Work	0	0	12	6
		TOTAL	6	0	12	12
		AUDIT COURSE				
1.	201AGPE	Professional Ethics and Human Value				2
		SOFT SKILL COURSE				
2.	201ASIM	Interview Skills Training and Mock Test				2

ELECTIVE I (SEMESTER VI)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1	20150E66A	Data Warehousing and Data Mining	3	0	0	3
2	20150E66B	Software Testing	3	0	0	3
3	20150E66C	Embedded Systems	3	0	0	3
4	20150E66D	Graph Theory and Applications	3	0	0	3
5	20150E66E	Digital Signal Processing	3	0	0	3

ELECTIVE II (SEMESTER VII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1	20150E75A	Big Data Analytics	3	0	0	3
2	20150E75B	Machine Learning Techniques	3	0	0	3
3	20150E75C	Software Project Management	3	0	0	3
4	20150E75D	Internet of Things	3	0	0	3
5	20150E75E	Service Oriented Architecture	3	0	0	3

ELECTIVE III (SEMESTER VII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E76A	Multi-core Architectures and Programming	3	0	0	3
2	20150E76B	Human Computer Interaction	3	0	0	3
3	20150E76C	C# and .Net Programming	3	0	0	3
4	20150E76D	Wireless Adhoc and Sensor Networks	3	0	0	3
5	20150E76E	Advanced Topics on Databases	3	0	0	3

ELECTIVE IV (SEMESTER VIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E81A	Digital Image Processing	3	0	0	3
2	20150E81B	Social Network Analysis	3	0	0	3
3	20150E81C	Information Security	3	0	0	3
4	20150E81D	Cyber Forensics	3	0	0	3
5	20150E81E	Soft Computing	3	0	0	3

ELECTIVE V (SEMESTER VIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20150E82A	Information Retrieval Techniques	3	0	0	3
2	20150E82B	Natural Language Processing	3	0	0	3
3	20150E82C	Parallel Algorithms	3	0	0	3
4	20150E82D	Speech Processing	3	0	0	3
5	20150E82E	Fundamentals of Nano Science	3	0	0	3

OPEN ELECTIVE I (SEMESTER V)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	ECE	20152OE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
2.		20152OE54B	Sensors And Transducers	3	0	0	3
3.	EEE	20153OE54A	Industrial Nano Technology	3	0	0	3
4.		20153OE54B	Energy Conservation and Management	3	0	0	3
5.	MECH	20154OE54A	Renewable energy sources	3	0	0	3
6.		20154OE54B	Automotive Systems	3	0	0	3
7.	CIVIL	20155OE54A	Air Pollution And Control Engineering	3	0	0	3
8.		20155OE54B	Geographic Information Systems	3	0	0	3
9.	CSE**	20150OE54A	Database Management Systems	3	0	0	3
10.		20150OE54B	Cloud Computing	3	0	0	3

**Offered for other Departments only

OPEN ELECTIVE II (SEMESTER VII)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	ECE	20152OE74A	Robotics	3	0	0	3
2.		20152OE74B	Electronic Devices	3	0	0	3
3.	EEE	20153OE74A	Basic Circuit Theory	3	0	0	3
4.		20153OE74B	Introduction To Renewable Energy Systems	3	0	0	3
5.	MECH	20154OE74A	Industrial Safety	3	0	0	3
6.		20154OE74B	Testing Of Materials	3	0	0	3
7.	CIVIL	20155OE74A	Green Building Design	3	0	0	3
8.		20155OE74B	Waste Water Treatment	3	0	0	3
9.	CSE**	20150OE74A	Introduction To C Programming	3	0	0	3
10.		20150OE74B	Datastructures And Algorithms	3	0	0	3

**Offered for other Departments only

20147S11	COMMUNICATIVE ENGLISH	L	T	P	C
		5	1	0	4

OBJECTIES:

- 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 a d their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English

TEXTBOOKS:

1. Board of Editors. **Using English** A Coursebook for Undergarduate Engineers and Technologists**.** Orient BlackSwan Limited, Hyd rabad: 2015
2. Richards, C. Jack. **Interchange Students' Book-2** N w D lhi: 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. Spe king Effectively: Developing Speaking Skills for Business English. Cambridge University Press, C mbridge: Reprint 2011
5. Dutt P. Kiranmai and Rajeev n Geeta. B sic Communication Skills, Foundation Books: 2013.

20148S12	ENGINEERING MATHEMATICS – I	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I DIFFERENTIAL CALCULUS 12

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT III INTEGRAL CALCULUS 12

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

UNIT IV MULTIPLE INTEGRALS 12

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

UNIT V DIFFERENTIAL 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 differentiation 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.

TEXTBOOKS:

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

REFERENCES:

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

20149S13	ENGINEERING PHYSICS	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I PROPERTIES OF MATTER 12

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

UNIT II WAVES AND FIBER OPTICS 12

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: 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 12

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 12

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

UNIT V CRYSTAL PHYSICS 12

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

TOTAL : 60 PERIODS

OUTCOMES:

Upon completion of this course,

- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of waves and optical devices and their applications

in fibre optics,

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

TEXTBOOKS:

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

REFERENCES:

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

20149S14	ENGINEERING CHEMISTRY	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloi al, so ium 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 adsor tion – dsorption 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 onollution abatement. Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

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

UNIT IV FUELS AND COMBUSTION 9

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

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries– primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H2-O2fuel cell.

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:

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.

20150S16	PROBLEM SOLVING AND PYTHON PROGRAMMING	L	T	P	C
		5	1	0	4

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.

TEXTBOOKS:

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

REFERENCES:

1. John V Guttag, ―Introduction to Computation and Programming Using Python‘‘, Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, ―Introduction to Programming in Python: An 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.

20154S15	ENGINEERING GRAPHICS	L	T	P	C
		2	0	4	4

OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (Not for Examination) 1 Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

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

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

UNIT III PROJECTION OF SOLIDS 5+12

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

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

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

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

TOTAL: 90 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

1. Natrajan K.V., ―A text book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., ―Engineering Graphics‖, New Age International (P) Limited, 2008.

REFERENCES:

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

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and 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

LABORATORY

0 0 3 2

OBJECTIVES:

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

LIST OF PROGRAMS:

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. 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.

20149L18 PYSICS 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

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 viscometery.

LIST OF EXPERIMENTS

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

OUTCOMES:

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

TEXTBOOK:

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

20147S21 **TECHNICAL ENGLISH** **L T P C**

5 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 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- newsapapers- 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 cgarts, 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/ talkls 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:

Learners should 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.

TEXTBOOKS:

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.

20148S22	ENGINEERING MATHEMATICS – II	L	T	P	C
		5	1	0	4

OBJECTIVES:

- This course is designed to cover topics such as Matrix Algebra, Vector Calculus, Complex Analysis and Laplace Transform. Matrix Algebra is one of the powerful tools to handle practical problems arising in the field of engineering. Vector calculus can be widely used for modelling the various laws of physics. The various methods of complex analysis and Laplace transforms can be used for efficiently solving the problems that occur in various branches of engineering disciplines

UNIT I MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvalues and Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms.

UNIT II VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and curl - Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral - Area of a curved surface - Volume integral - Green‘s, Gauss divergence and Stoke‘s theorems – Verification and application in evaluating line, surface and volume integrals.

UNIT III ANALYTIC FUNCTIONS **12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates
- Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $w=z+c, cz, 1/z, z^2$- Bilinear transformation.

UNIT IV COMPLEX INTEGRATION **12**

Line integral - Cauchy‘s integral theorem – Cauchy‘s integral formula – Taylor‘s and Laurent‘s series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.

UNIT V LAPLACE TRANSFORMS **12**

Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL : 60

PERIODS OUTCOMES:Learners should be able to:

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

TEXTBOOKS:

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

REFERENCES:

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

20149S23A PHYSICS FOR INFORMATION SCIENCE (Common to CSE & IT)

L	T	P	C
5	1	0	4

OBJECTIVES:

- To understand the essential principles of Physics of semiconductor device and Electron transport properties. Become proficient in magnetic and optical properties of materials and Nano-electronic devices.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS 12

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

UNIT II SEMICONDUCTOR PHYSICS 12

Intrinsic Semiconductors – Energy band diagram – direct and indirect 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 12

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction-saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses— Magnetic principle in computer data storage – Magnetic hard disc (GMR sensor).

UNIT IV OPTICAL PROPERTIES OF MATERIALS 12

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V NANO DEVICES 12

Electron density in bulk material – Size dependence of Fermi energy – Quantum confinement – Quantum structures – Density of states in quantum well, quantum wire and quantum dot structure - Band gap of nanomaterials – Tunneling: single electron phenomena and single electron transistor – Quantum dot laser. Conductivity of metallic nanowires – Ballistic transport – Quantum resistance and conductance – Carbon nanotubes: Properties and applications .

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to:

- Gain knowledge on classical and quantum electron theories, and energy band structuues,
- Acquire knowledge on basics of semiconductor physics and its applications in various devices,
- Get knowledge on magnetic properties of materials and their applications in data storage,
- Have the necessary understanding on the functioning of optical materials for optoelectronics,
- Understand the basics of quantum structures and their applications in carbon electronics..

TEXTBOOKS:

1. Jasprit Singh, ―Semiconductor Devices: Basic Principles‖, Wiley 2012.
2. Kasap, S.O. ―Principles of Electronic Materials and Devices‖, McGraw-Hill Education, 2007.
3. Kittel, C. ―Introduction to Solid State Physics‖. Wiley, 2005.

REFERENCES:

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

20153S25A	BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT ENGINEERING	L	T	P	C
		5	1	0	4

OBJECTIVES:

- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the principles and operation of measuring instruments and transducers

UNIT I ELECTRICAL CIRCUITS ANALYSIS 12

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems – The venins theorem, Norton theorem, maximum power transfer theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

UNIT II ELECTRICAL MACHINES 12

DC and AC ROTATING MACHINES:Types, Construction, principle, Emf and torque equation, application Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers- Introduction- types and construction, working principle of Ideal transformer-Emf equation- All day efficiency calculation.

UNIT III UTILIZATION OF ELECTRICAL POWER 12

Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Batteries-NiCd, Pb Acid and Li ion– Charge and Discharge Characteristics. Protection- need for earthing, fuses and circuit breakers.Energy Tariff calculation for domestic loads.

UNIT IV ELECTRONIC CIRCUITS 12

PN Junction-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 12

Characteristic of measurement-errors in measurement, torque in indicating instruments-moving coil and moving iron meters, Energy meter and watt meter. Transducers-classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to:

- Discuss the essentials of electric circuits and analysis.
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and common domestic loads.
- Introduction to measurement and metering for electric circuits.

TEXTBOOKS:

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. 2. B.L Theraja, Fundamentals of Electrical Engineering and Electronics. Chand & Co, 2008.
3. 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.

20149S24A ENVIRONMENTAL SCIENCE AND ENGINEERING

	L	T	P	C
	5	1	0	4

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world;
- envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth‟s interior and
- surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **12**

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 **12**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural

UNIT III ENVIRONMENTAL POLLUTION **12**

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, 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 12

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 12

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disas

TEXTBOOKS:

1. Benny Joseph, _Environmental Science and Engineering‘, Tata McGraw-Hill, New Delhi, 2006.
2. 2. Gilbert M.Masters, _Introduction to Environmental Engineering and Science‘, 2nd edition, Pearson Education, 2004.

REFERENCES:

1. Dharmendra S. Sengar, _Environmental law‘, Prentice hall of India PVT LTD,New Delhi, 2007.
2. 2. Erach Bharucha, ―Textbook of Environmental Studies‖, Universities Press(I) PVT, LTD, Hydrabad, 2015.
3. 3. Rajagopalan, R, _Environmental Studies-From Crisis to Cure‘, Oxford University Press, 2005.
4. 4. G. Tyler Miller and Scott E. Spoolman, ―Environmental Science‖, Cengage Learning India PVT, LTD, Delhi, 2014.

20150S26A

Programming in C

	L	T	P	C
	5	1	0	4

OBJECTIVES:

- To develop C Programs using basic programming constructs
- To develop C programs using arrays and strings
- To develop applications in C using functions , pointers and structures
- To do input/output and file handling in C

UNIT I BASICS OF C PROGRAMMING **12**

Introduction to programming paradigms - Structure of C program - C programming: Data Types – Storage classes - Constants – Enumeration Constants - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process

UNIT II ARRAYS AND STRINGS **9+3**

Introduction to Arrays: Declaration, Initialization – One dimensional array – Example Program: Computing Mean, Median and Mode - Two dimensional arrays – Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String operations: length, compare, concatenate, copy – Selection sort, linear and binary search

UNIT III FUNCTIONS AND POINTERS **9+3**

Introduction to functions: Function prototype, function definition, function call, Built-in functions (string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions – Pointers – Pointer operators
– Pointer arithmetic – Arrays and pointers – Array of pointers – Example Program: Sorting of names
– Parameter passing: Pass by value, Pass by reference – Example Program: Swapping of two numbers and changing the value of a variable using pass by reference

UNIT IV STRUCTURES **9+3**

Structure - Nested structures – Pointer and Structures – Array of structures – Example Program using structures and pointers – Self referential structures – Dynamic memory allocation - Singly linked list - typedef

UNIT V FILE PROCESSING **9+3**

Files – Types of file processing: Sequential access, Random access – Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Transaction processing using random access files – Command line arguments

TOTAL : 60 PERIODS

OUTCOMES:

Learners should be able to:

- Develop simple applications in C using basic constructs
- Design and implement applications using arrays and strings
- Develop and implement applications in C using functions and pointers.
- Develop applications in C using structures.
- Design applications using sequential and random access file processing.

TEXTBOOKS:

1. Reema Thareja, ―Programming in C‖, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, ―The C Programming language‖, Second Edition, Pearson Education, 2006

REFERENCES:

1. Paul Deitel and Harvey Deitel, ―C How to Program‖, 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.

20154L27

ENGINEERING PRACTICES LABORATORY

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

OBJECTIVES:

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

GROUP A (CIVIL & MECHANICAL)

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, foundary and fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and
other fittings. **15 Sets.**
2. Carpentry vice (fitted to 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

		L	T	P	C
20150L28A	**C PROGRAMMING LABORATORY**	**0**	**0**	**3**	**2**

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

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.

20148C31A

DISCRETE MATHEMATICS

L	T	P	C
4	0	0	4

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 a d 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.

TEXTBOOKS:

1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.

REFERENCES:

1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

20150C32	DIGITAL PRINCIPLES AND SYSTEM DESIGN	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To design digital circuits using simplified Boolean functions
- To analyze and design combinational circuits
- To analyze and design synchronous and asynchronous sequential circuits
- To understand Programmable Logic Devices
- To write HDL code for combinational and sequential circuits

UNIT I BOOLEAN ALGEBRA AND LOGIC GATES 12

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates
- Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms
- Simplification of Boolean Functions using Karnaugh Map - Logic Gates – NAND and NOR Implementations.

UNIT II COMBINATIONAL LOGIC 12

Combinational Circuits – Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders – Encoders – Multiplexers - Introduction to HDL – HDL Models of Combinational circuits.

UNIT III SYNCHRONOUS SEQUENTIAL LOGIC 12

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT IV ASYNCHRONOUS SEQUENTIAL LOGIC 12

Analysis and Design of Asynchronous Sequential Circuits – Reduction of State and Flow Tables – Race- free State Assignment – Hazards.

UNIT V MEMORY AND PROGRAMMABLE LOGIC 12

RAM – Memory Decoding – Error Detection and Correction - ROM - Programmable Logic Array –Programmable Array Logic – Sequential Programmable Devices.

TOTAL : 60 PERIODS

OUTCOMES:

On Completion of the course, the students should be able to:

- Simplify Boolean functions using KMap
- Design and Analyze Combinational and Sequential Circuits
- Implement designs using Programmable Logic Devices
- Write HDL code for combinational and Sequential Circuits

TEXTBOOKS:

1. M. Morris R. Mano, Michael D. Ciletti, ―Digital Design: With an Introduction to the Verilog **HDL, VHDL, and System Verilog‖, 6th Edition, Pearson Education, 2017.**

REFERENCES:

1. G. K. Kharate, Digital Electronics, Oxford University Press, 2010
2. John F. Wakerly, Digital Design Principles and Practices, Fifth Edition, Pearson Education, 2017.
3. Charles H. Roth Jr, Larry L. Kinney, Fundamentals of Logic Design, Sixth Edition, CENGAGE Learning, 2013
4. Donald D. Givone, Digital Principles and Design‖, Tata Mc Graw Hill, 2003.

20150C33	DATA STRUCTURES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of ADTs
- To Learn linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I LINEAR DATA STRUCTURES – LIST 9

Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation singly linked lists- circularly linked lists- doubly-linked lists – applications of lists –Polynomial Manipulation – All operations (Insertion, Deletion, Merge, Traversal).

UNIT II LINEAR DATA STRUCTURES – STACKS, QUEUES 9

Stack ADT – Operations - Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression - Queue ADT – Operations - Circular Queue – Priority Queue - deQueue – applications of queues.

UNIT III NON LINEAR DATA STRUCTURES – TREES 9

Tree ADT – tree traversals - Binary Tree ADT – expression trees – applications of trees – binary search tree ADT –Threaded Binary Trees- AVL Trees – B-Tree - B+ Tree - Heap – Applications of heap.

UNIT IV NON LINEAR DATA STRUCTURES - GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – Topological Sort – Bi-connectivity – Cut vertex – Euler circuits – Applications of graphs.

UNIT V SEARCHING, SORTING AND HASHING TECHNIQUES 9

Searching- Linear Search - Binary Search. Sorting - Bubble sort - Selection sort - Insertion sort - Shell sort – Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing – Extendible Hashing.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Implement abstract data types for linear data structures.
- Apply the different linear and non-linear data structures to problem solutions.
- Critically analyze the various sorting algorithms.

TEXTBOOKS:

1. Mark Allen Weiss, ―Data Structures and Algorithm Analysis in C‖, 2nd Edition, Pearson Education,1997.
2. Reema Thareja, ―Data Structures Using C‖, Second Edition , Oxford University Press, 2011

REFERENCES:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, ―Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002.
2. Aho, Hopcroft and Ullman, ―Data Structures and Algorithms‖, Pearson Education,1983.
3. Stephen G. Kochan, ―Programming in C‖, 3rd edition, Pearson Education.
4. Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, ―Fundamentals of Data Structures in C‖, Second Edition, University Press, 2008

20150C34	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

TEXTBOOKS:

1. Herbert Schildt, ―Java The complete reference‖, 8th Edition, McGraw Hill Education, 2011.
2. Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015.
2. Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011.
3. Timothy Budd, ―Understanding Object-oriented programming with Java‖, Updated Edition, Pearson Education, 2000.

20150C35	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,

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.

TEXTBOOKS:

1. H Taub, D L Schilling, G Saha, ―Principles of Communication Systems‖ 3/e, TMH 2007
2. 2. S. Haykin ―Digital Communications‖ John Wiley 2005

REFERENCES:

1. B.P.Lathi, ―Modern Digital and Analog Communication Systems‖, 3rd edition, Oxford University Press, 2007
2. 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.

20150L36	DATA STRUCTURES LABORATORY	L	T	P	C
		0	0	3	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

- Array implementation of Stack and Queue ADTs
- Array implementation of List ADT
- Linked list implementation of List, Stack and Queue ADTs
- Applications of List, Stack and Queue ADTs
- Implementation of Binary Trees and operations of Binary Trees
- Implementation of Binary Search Trees
- Implementation of AVL Trees
- Implementation of Heaps using Priority Queues.
- Graph representation and Traversal algorithms
- Applications of Graphs
- Implementation of searching and sorting algorithms
- Hashing – any two collision techniques

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course, the student should 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**

20150L37 OBJECT ORIENTED PROGRAMMING LABORATORY

L	T	P	C
0	0	3	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.

20150L38 DIGITAL SYSTEMS LABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- To understand the various basic logic gates
- To design and implement the various combinational circuits
- To design and implement combinational circuits using MSI devices.
- To design and implement sequential circuits
- To understand and code with HDL programming

LIST OF EXPERIMENTS

1. Verification of Boolean Theorems using basic gates.
2. Design and implementation of combinational circuits using basic gates for arbitrary functions, code converters.
3. Design and implement Half/Full Adder and Subtractor.
4. Design and implement combinational circuits using MSI devices:
    a. 4 – bit binary adder / subtractor
    b. Parity generator / checker
    c. Magnitude Comparator
    d. Application using multiplexers
5. Design and implement shift-registers.
6. Design and implement synchronous counters.
7. Design and implement asynchronous counters.
8. Coding combinational circuits using HDL.
9. Coding sequential circuits using HDL.
10. Design and implementation of a simple digital system (Mini Project).

TOTAL : 60 PERIODS

OUTCOMES:

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

- Implement simplified combinational circuits using basic logic gates
- Implement combinational circuits using MSI devices
- Implement sequential circuits like registers and counters
- Simulate combinational and sequential circuits using HDL

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS HARDWARE:

1. Digital trainer kits - 30
2. Digital ICs required for the experiments in sufficient numbers

SOFTWARE:

1. HDL simulator.

20150L39 *INTERPERSONAL SKILLS/LISTENING & SPEAKING*

L	T	P	C
0	0	2	1

OBJECTIVES:

The Course will enable 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, the student should be able to:

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

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 MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013.
4. Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5. Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014

20148C41A **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.

12

UNIT I PROBABILITY AND RANDOM VARIABLES

Probability – Axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II TWO - DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III RANDOM PROCESSES **12**

Classification – Stationary process – Markov process - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT IV QUEUEING MODELS **12**

Markovian queues – Birth and death processes – Single and multiple server queueing models – Little's formula - Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.

UNIT V ADVANCED QUEUEING MODELS **12**

Finite source models - M/G/1 queue – Pollaczek Khinchin formula - M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.

TOTAL : 60 PERIODS

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

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of random processes in engineering disciplines.
- Acquire skills in analyzing queueing models.
- Understand and characterize phenomenon which evolve with respect to time in a

probabilistic manner

TEXTBOOKS:

1. Gross, D., Shortle, J.F, Thompson, J.M and Harris. C.M., ―Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2. Ibe, O.C., ―Fundamentals of Applied Probability and Random Processes", Elsevier, 1st Indian Reprint, 2007.

REFERENCES:

1. Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2004.
2. Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3. Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
4. Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

20150C42 **COMPUTER ARCHITECTURE**

L	T	P	C
3	0	0	3

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:

At the end of the course, the student 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.

TEXTBOOKS:

1. David A. Patterson and John L. Hennessy, Computer Organization and Design: The Hardware/Software Interface, Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, Computer Organization and Embedded Systems, Sixth Edition, Tata McGraw Hill, 2012.

REFERENCES:

1. William Stallings, Computer Organization and Architecture – Designing for Performance, Eighth Edition, Pearson Education, 2010.
2. John P. Hayes, Computer Architecture and Organization, Third Edition, Tata McGraw Hill, 2012.
3. John L. Hennessey and David A. Patterson, Computer Architecture – A Quantitative Approach‖, Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

20150C43 **DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.
- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNIT I RELATIONAL DATABASES **9**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II DATABASE DESIGN **9**

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III TRANSACTIONS **9**

Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV IMPLEMENTATION TECHNIQUES **9**

RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V ADVANCED TOPICS **9**

Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should 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.

TEXTBOOKS:

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, ―Database System Concepts‖, Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition, Pearson Education, 2011.

REFERENCES:

1. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, ―Database Management Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,"Database Management Systems‖, Tata McGraw Hill, 2011.

20150C44 DESIGN AND ANALYSIS OF ALGORITHMS

L	T	P	C
3	0	0	3

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 an – String Matching - Closest-Pair and Convex-Hull Problems - Exhaustive Search - Travelling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Binary Search – Merge sort – Quick sort – Heap Sort - Multiplication of Large Integers – Closest-Pair and Convex - Hull Problems.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 9

Dynamic programming – Principle of optimality - Coin changing problem, Computing a Binomial Coefficient – Floyd‘s algorithm – Multi stage graph - Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique – Container loading problem - Prim‘s algorithm and Kruskal's Algorithm – 0/1 Knapsack problem, Optimal Merge pattern - Huffman Trees.

UNIT IV ITERATIVE IMPROVEMENT 9

The Simplex Method - The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs, Stable marriage Problem.

UNIT V COPING WITH THE LIMITATIONS OF ALGORITHM POWER 9

Lower - Bound Arguments - P, NP NP- Complete and NP Hard Problems. Backtracking – n-Queen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Travelling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Travelling Salesman problem – Knapsack problem.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student 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.

TEXTBOOKS:

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/

20150C45	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 9

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II PROCESS MANAGEMENT 9

Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III STORAGE MANAGEMENT 9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV FILE SYSTEMS AND I/O SYSTEMS 9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT V CASE STUDY 9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers.
- Compare iOS and Android Operating Systems.

TEXTBOOKS:

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, ―Operating System Concepts‖, 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES:

1. Ramaz Elmasri, A. Gil Carrick, David Levine, ―Operating Systems – A Spiral Approach‖, Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, ―Operating Systems‖, McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, ―Modern Operating Systems‖, Second Edition, Pearson Education, 2004.
4. Gary Nutt, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, ―Operating Systems‖, Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, ―Understanding the Linux kernel‖, 3rd edition, O'Reilly, 2005.
7. Neil Smyth, ―iPhone iOS 4 Development Essentials – Xcode‖, Fourth Edition, Payload media, 2011.

20150C46	SOFTWARE ENGINEERING	L	T	P	C
		3	0	0	3

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:

At the end of the course, the student 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.

TEXTBOOKS:

1. Roger S. Pressman, ―Software Engineering – A Practitioner‟s Approach‖, Seventh Edition, Mc Graw-Hill International Edition, 2010.
2. 2. Ian Sommerville, ―Software Engineering‖, 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, ―Fundamentals of Software Engineering‖, Third Edition, PHI Learning PrivateLimited, 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

20150L47 **DATABASE MANAGEMENT SYSTEMS** *LABORATORY*

L	T	P	C
0	0	3	2

OBJECTIVES:

- 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
- 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

20150L48	OPERATING SYSTEMS LABORATORY	L	T	P	C
		0	0	3	2

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

20150L49 **ADVANCED READING AND WRITING** **L T P C**

0 0 2 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- visumes – Job application-project writing-writing convincing proposals.

UNIT V

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

TOTAL : 30 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

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

20148C51A	ALGEBRA AND NUMBER THEORY	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To introduce the basic notions of groups, rings, fields which will then be used to solve related problems.
- To 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 **9**

Rings - Polynomial rings - Irreducible polynomials over finite fields - Factorization of polynomials over finite fields.

UNIT III DIVISIBILITY THEORY AND CANONICAL DECOMPOSITIONS **9**

Division algorithm – Base - b representations – Number patterns – Prime and composite numbers – GCD – Euclidean algorithm – Fundamental theorem of arithmetic – LCM.

UNIT IV DIOPHANTINE EQUATIONS AND CONGRUENCES **9**

Linear Diophantine equations – Congruence‘s – Linear Congruence‘s - Applications: Divisibility tests - Modular exponentiation-Chinese remainder theorem – 2 x 2 linear systems.

UNIT V CLASSICAL THEOREMS AND MULTIPLICATIVE FUNCTIONS **9**

Wilson‘s theorem – Fermat‘s little theorem – Euler‘s theorem – Euler‘s Phi functions – Tau and Sigma functions.

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course, the student 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, 5th Edition, New Delhi, 2007.
2. Koshy, T., ―Elementary Number Theory with Applications‖, Elsevier Publications, New Delhi, 2002.

REFERENCES:

1. Lidl, R. and Pitz, G, "Applied Abstract Algebra", Springer Verlag, New Delhi, 2nd Edition, 2006.
2. Niven, I., Zuckerman.H.S., and Montgomery, H.L., ―An Introduction to Theory of Numbers‖, John Wiley and Sons , Singapore, 2004.
3. San Ling and Chaoping Xing, ―Coding Theory – A first Course‖, Cambridge Publications, Cambridge, 2004.

20150C52	COMPUTER NETWORKS	L	T	P	C
		3	0	0	3

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:

At the end of the course, the student 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.

TEXTBOOKS:

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.

20150C53 MICROPROCESSORS AND MICROCONTROLLERS

	L	T	P	C
	3	0	0	3

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

UNIT I THE 8086 MICROPROCESSOR 9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks

- Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

TOTAL : 45 PERIODS

OUTCOMES:

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

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TEXTBOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, ―Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design‖, 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. Doughlas V.Hall, ―Microprocessors and Interfacing, Programming and Hardware‖,TMH,2012
2. A.K.Ray,K.M.Bhurchandi,‖Advanced Microprocessors and Peripherals ―3rd edition, Tata McGrawHill,2012

20150C55 **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.

OUTCOMES:

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

- Construct automata, regular expression for any pattern.
- Write Context free grammar for any construct.
- Design Turing machines for any language.
- Propose computation solutions using Turing machines.
- Derive whether a problem is decidable or not.

TEXTBOOKS:

TOTAL : 45 PERIODS

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

20150C56	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

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 student should be able to:

- Express software design with UML diagrams
- Design software applications using OO concepts.
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern based design using design patterns
- Understand the various testing methodologies for OO software

TEXTBOOKS:

1. Craig Larman, ―Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition - 1999

REFERENCES:

1. Erich Gamma, a n d 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.

20150L57 *MICROPROCESSORS AND MICROCONTROLLERS LABORATORY*

L	T	P	C
0	0	3	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

20150L58 *OBJECT ORIENTED ANALYSIS AND DESIGN LABORATORY*

L	T	P	C
0	0	3	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.

LIST OF EXPERIMENTS

Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the 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:

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

- Upon completion of this course, the students will be able to:
- Perform OO analysis and design for a given problem specification.
- Identify and map basic software requirements in UML mapping.
- Improve the software quality using design patterns and to explain the rationale behind applying specific design patterns
- Test the compliance of the software with the SRS

20150L59 **NETWORKS LABORATORY**

L	T	P	C
0	0	3	2

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:
    a. Echo client and echo server
    b. Chat
    c. 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:

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

- Implement various protocols using TCP and UDP.
- Compare the performance of different transport layer protocols.
- Use simulation tools to analyze the performance of various network protocols.
- Analyze various routing algorithms.
- Implement error correction codes.

20150C61

INTERNET PROGRAMMING

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand different Internet Technologies.
- To learn java-specific web services architectureTo design a context free grammar for any given language

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

ava 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 student 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 applicationsDerive whether a problem is decidable or not.

TEXTBOOKS:

1.J 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.

20150C62 **ARTIFICIAL INTELLIGENCE** **L T P C**

3 0 0 3

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.

9

UNIT V APPLICATIONS

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Use appropriate search algorithms for any AI problem
- Represent a problem using first order and predicate logic
- Provide the apt agent strategy to solve a given problem
- Design software agents to solve a problem
- Design applications for NLP that use Artificial Intelligence.

TEXTBOOKS:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009.

2 I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, 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.

20150C63 **MOBILE COMPUTING** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

UNIT I INTRODUCTION 9

Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT II MOBILE TELECOMMUNICATION SYSTEM 9

Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT III MOBILE NETWORK LAYER 9

Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) – MANET Vs VANET – Security.

UNIT IV MOBILE TRANSPORT AND APPLICATION LAYER 9

Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT V MOBILE PLATFORMS AND APPLICATIONS 9

Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

OUTCOMES:

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

- Explain the basics of mobile telecommunication systems

TOTAL : 45 PERIODS

- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

TEXTBOOKS:

1. Jochen Schiller, ―Mobile Communications‖, 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 Agarval, 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
3. Mobile Computing‖, Springer, 2003.
4. William.C.Y.Lee,―Mobile Cellular Telecommunications-Analog and Digital Systems‖,
5. Second Edition,TataMcGraw Hill Edition ,2006.
6. C.K.Toh, ―AdHoc Mobile Wireless Networks‖, First Edition, Pearson Education, 2002.
7. Android Developers : http://developer.android.com/index.html
8. Apple Developer : https://developer.apple.com/
9. Windows Phone DevCenter : http://developer.windowsphone.com
10. BlackBerry Developer : http://developer.blackberry.com

20150C64	COMPILER DESIGN	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT I INTRODUCTION TO COMPILERS **9**

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II SYNTAX ANALYSIS **9**

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table - Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC..

UNIT III INTERMEDIATE CODE GENERATION **9**

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV RUN-TIME ENVIRONMENT AND CODE GENERATION **9**

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

9

UNIT V CODE OPTIMIZATION

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks- Global Data Flow Analysis - Efficient Data Flow Algorithm.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Understand the different phases of compiler.
- Design a lexical analyzer for a sample language.
- Apply different parsing algorithms to develop the parsers for a given grammar.
- Understand syntax-directed translation and run-time environment.
- Learn to implement code optimization techniques and a simple code generator.
- Design and implement a scanner and a parser using LEX and YACC tools.

TEXTBOOKS:

1. **J Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools‖, Second Edition, Pearson Education, 2009.**

REFERENCES:

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation‖, Morgan Kaufmann Publishers - Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler‖, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. V. Raghavan, Principles of Compiler Design‖, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C‖, Prentice-Hall Software Series, 1993.

20150C65

DISTRIBUTED SYSTEMS

L	T	P	C
3	1	0	4

OBJECTIVES:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in
- Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT I INTRODUCTION **9**

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems – Message-passing systems versus shared memory systems –Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. A model of distributed computations: A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications. Logical Time: A framework for a system of logical clocks –Scalar time –Vector time – Physical clock synchronization: NTP.

UNIT II MESSAGE ORDERING & SNAPSHOTS **9**

Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. Global state and snapshot recording algorithms: Introduction –System model and definitions –Snapshot algorithms for FIFO channels.

9

UNIT III DISTRIBUTED MUTEX & DEADLOCK

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport‘s algorithm – Ricart- 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.

9

UNIT IV RECOVERY & CONSENSUS

Checkpointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. Consensus and agreement algorithms: Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V P2P & DISTRIBUTED SHARED MEMORY **9**

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. Distributed shared memory: Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the student should 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 systemsnot.

TEXTBOOKS:

1. Kshemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimore and Tim Kindberg, ―Distributed Systems Concepts and Design‖, Fifth Edition, Pearson Education, 2012.

REFERENCES:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Mukesh Singhal and 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.

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20150L67 INTERNET PROGRAMMING LABORATORY

L	T	P	C
0	0	3	2

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,
    3. credit card number) would be stored in web.xml. Each user should have a separate
    4. 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.
    5. Write a Program, which takes user Id as an input and returns the User details by taking the user information from the XML document

    6. i. Validate the form using PHP regular expression. ii. PHP stores a form data into database.
    7. Write a web service for finding what people think by asking 500 people‘s opinion for any
    8. consumer product.

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course, the student should 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.

20150L68 MOBILE APPLICATION DEVELOPMENT LABORATORY

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:

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

- Develop mobile applications using GUI and Layouts.
- Develop mobile applications using Event Listener.
- Develop mobile applications using Databases.
- Develop mobile applications using RSS Feed, Internal/External Storage, SMS, Multi- threading and GPS.
- Analyze and discover own mobile app for simple needs.

20150LPC **PROFESSIONAL COMMUNICATION**

L	T	P	C
3	1	0	4

OBJECTIVES:

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

UNIT I **9**

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

UNIT II **9**

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

UNIT III **9**

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

UNIT IV **9**

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

UNIT V **9**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

RECOMMENDED SOFTWARE

1. JGlobearena
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, 5
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.

20150S71

PRINCIPLES OF MANAGEMENT

L	T	P	C
3	1	0	4

OBJECTIVES:

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

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

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

UNIT II PLANNING 9

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

UNIT III ORGANISING 9

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

UNIT IV DIRECTING 9

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

9

UNIT V CONTROLLING

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, ―Management‖, Prentice Hall (India) Pvt. Ltd., 10th Edition,2009.

2. JAF Stoner, Freeman R.E and Daniel R Gilbert ―Management‖, Pearson Education, 6thEdition, 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

20150C72 **CRYPTOGRAPHY AND NETWORK SECURITY**

L	T	P	C
3	1	0	4

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks..

UNIT I INTRODUCTION **9**

Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem – cryptanalysis.

UNIT II SYMMETRIC KEY CRYPTOGRAPHY **9**

MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid‟s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- SYMMETRIC KEY CIPHERS: 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.

UNIT III PUBLIC KEY CRYPTOGRAPHY **9**

MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: Primes – Primality Testing – Factorization – Euler‘s totient function, Fermat‘s and Euler‘s Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange - ElGamal cryptosystem – Elliptic curve arithmetic-Elliptic curve cryptography.

UNIT IV MESSAGE AUTHENTICATION AND INTEGRITY **9**

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA –Digital signature and authentication protocols – DSS- Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509

UNIT V SECURITY PRACTICE AND SYSTEM SECURITY **9**

Electronic Mail security – PGP, S/MIME – IP security – Web Security - SYSTEM SECURITY: Intruders – Malicious software – viruses – Firewalls.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the 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

TEXTBOOKS:

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

20150C73 **CLOUD COMPUTING** **L T P C**

3 1 0 4

OBJECTIVES:

- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I INTRODUCTION 9

Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II CLOUD ENABLING TECHNOLOGIES 9

Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as- a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV RESOURCE MANAGEMENT AND SECURITY IN CLOUD 9

Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods– Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges –Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM –Security Standards.

UNIT V CLOUD TECHNOLOGIES AND ADVANCEMENTS 9

Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine — Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the 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.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXTBOOKS:

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.

20150L77 **CLOUD COMPUTING LABORATORY**

L	T	P	C
0	0	3	2

OBJECTIVES:

- To develop web applications in cloud
- To learn the design and development process involved in creating a cloud based application
- To learn to implement and use parallel programming using Hadoop

LIST OF EXPERIMENTS

1. 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 DemoVersion)
8. Install Hadoop single node cluster and run simple applications like wordcount.

TOTAL : 60 PERIODS

OUTCOMES:

At the end of the course, the student should 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.

20150L78	SECURITY LABORATORY	L	T	P	C
		0	0	3	2

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:

At the end of the course, the student should 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

-LIST OF ELECTIVES -

20150E66A	DATA WAREHOUSING AND DATA MINING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE ANALYTICAL PROCESSING(OLAP) 9

Basic Concepts - Data Warehousing Components – Building a Data Warehouse – Database Architectures for Parallel Processing – Parallel DBMS Vendors - Multidimensional Data Model – Data Warehouse Schemas for Decision Support, Concept Hierarchies -Characteristics of OLAP Systems – Typical OLAP Operations, OLAP and OLTP.

UNIT II DATA MINING – INTRODUCTION 9

Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques– Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT III DATA MINING - FREQUENT PATTERN ANALYSIS 9

Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT IV CLASSIFICATION AND CLUSTERING 9

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines –– Lazy Learners – Model Evaluation and Selection- Techniques to improve Classification Accuracy.

Clustering Techniques – Cluster analysis-Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT V WEKA TOOL 9

Datasets – Introduction, Iris plants database, Breast cancer database, Auto imports database - Introduction to WEKA, The Explorer – Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association–rule learners.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Design a Data warehouse system and perform business analysis with OLAP tools.
- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis

TEXTBOOKS:

1. Jiawei Han and Micheline Kamber, ―Data Mining Concepts and Techniques‖, Third Edition, Elsevier, 2012.

REFERENCES:

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, Tata McGraw – Hill Edition, 35th Reprint 2016.
2. K.P. Soman, Shyam Diwakar and V. Ajay, ―Insight into Data Mining Theory and Practice‖, Eastern Economy Edition, Prentice Hall of India, 2006.
3. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools and Techniques‖, Elsevier, Second Edition.

20150E66B **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 student should 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.

TEXTBOOKS:

1. Srinivasan Desikan and Gopalaswamy Ramesh, ―Software Testing – Principles and Practices‖, Pearson Education, 2006.

2. Ron Patton, ―Software Testing‖, Second Edition, Sams Publishing, Pearson Education, 2007.

AU Library.com

REFERENCES:

1. Ilene Burnstein, ―Practical Software Testing‖, Springer International Edition, 2003.

2. Edward Kit,‖ Software Testing in the Real World – Improving the Process‖, Pearson Education, 1995.

3. Boris Beizer,‖ Software Testing Techniques‖ – 2nd Edition, Van Nostrand Reinhold, New York, 1990.

4. Aditya P. Mathur, ―Foundations of Software Testing _ Fundamental Algorithms and Techniques‖, Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 2008.

20150E66C **EMBEDDED SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the architecture and programming of ARM processor.
- To become familiar with the embedded computing platform design and analysis.
- To get thorough knowledge in interfacing concepts
- To design an embedded system and to develop programs.

UNIT I INTRODUCTION TO EMBEDDED COMPUTING AND ARM PROCESSORS **9**

Complex systems and micro processors– Embedded system design process –Design example: Model train controller- Instruction sets preliminaries - ARM Processor – CPU: programming input and output- supervisor mode, exceptions and traps – Co-processors- Memory system mechanisms – CPU performance- CPU power consumption..

UNIT II EMBEDDED COMPUTING PLATFORM DESIGN **9**

The CPU Bus-Memory devices and systems–Designing with computing platforms – consumer electronics architecture – platform-level performance analysis - Components for embedded programs- Models of programs- Assembly, linking and loading – compilation techniques- Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size- Program validation and testing.

UNIT III SENSOR INTERFACING WITH ARDUINO **9**

Basics of hardware design and functions of basic passive components-sensors and actuators-Arduino code - library file for sensor interfacing-construction of basic applications

UNIT IV EMBEDDED FIRMWARE **9**

Reset Circuit, Brown-out Protection Circuit-Oscillator Unit - Real Time Clock-Watchdog Timer - Embedded Firmware Design Approaches and Development Languages.

UNIT V EMBEDDED C PROGRAMMING **9**

Introduction-Creating _hardware delays‘ using Timer 0 and Timer 1-Reading switches-Adding Structure to the code-Generating a minimum and maximum delay-Example: Creating a portable hardware delay- Timeout mechanisms-Creating loop timeouts-Testing loop timeouts-hardware timeouts-Testing a hardware timeout

TOTAL : 45 PERIODS

OUTCOMES:

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

- Describe the architecture and programming of ARM processor.
- Explain the concepts of embedded systems
- Understand the Concepts of peripherals and interfacing of sensors.
- Capable of using the system design techniques to develop firmware
- Illustrate the code for constructing a system

TEXTBOOKS:

1. Marilyn Wolf, ―Computers as Components - Principles of Embedded Computing System
2. Design‖, Third Edition ―Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (unit I & II)
3. https://www.coursera.org/learn/interface-with-arduino#syllabus (Unit III)
4. Michael J. Pont, ―Embedded C‖, 2 nd Edition, Pearson Education, 2008.(Unit IV & V)

REFERENCES:

1. Shibu K.V, ―Introduction to Embedded Systems‖, McGraw Hill.2014
2. Jonathan W.Valvano, ―Embedded Microcomputer Systems Real Time Interfacing‖, Third Edition Cengage Learning, 2012
3. Raj Kamal, ―Embedded Systems-Architecture,programming and design‖, 3 edition,TMH.2015
4. Lyla, ―Embedded Systems‖, Pearson , 2013
5. David E. Simon, ―An Embedded Software Primer‖, Pearson Education,2000.

20150E66D **GRAPH THEORY AND APPLICATIONS** **L T P C**

3 1 0 4

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I **9**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II **9**

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration- Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III **9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

9

UNIT IV

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V **9**

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Understand the basic concepts of graphs, and different types of graphs
- Understand the properties, theorems and be able to prove theorems.
- Apply suitable graph model and algorithm for solving applications.

TEXTBOOKS:

1. Narsingh Deo, "Graph Theory with Application to Engineering and Computer Science", Prentice-Hall of India Pvt.Ltd, 2003.
2. L.R.Foulds , "Graph Theory Applications", Springer ,2016.

REFERENCES:

1 .Bondy, J. A. and Murty, U.S.R., "Graph Theory with Applications", North Holland Publication,2008.

2. West, D. B., ―Introduction to Graph Theory‖, Pearson Education, 2011.
3. John Clark, Derek Allan Holton, ―A First Look at Graph Theory‖, World Scientific Publishing Company, 1991.
4. Diestel, R, "Graph Theory", Springer,3rd Edition,2006.
5. Kenneth H.Rosen, "Discrete Mathematics and Its Applications", Mc Graw Hill, 2007.

20150E66E **DIGITAL SIGNAL PROCESSING** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the basics of discrete time signals, systems and their classifications.
- To analyze the discrete time signals in both time and frequency domain.
- To design lowpass digital IIR filters according to predefined specifications based on analog filter theory and analog-to-digital filter transformation.
- To design Linear phase digital FIR filters using fourier method, window technique
- To realize the concept and usage of DSP in various engineering fields.

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 9

Introduction to DSP – Basic elements of DSP– Sampling of Continuous time signals–Representation, Operation and Classification of Discrete Time Signal–Classification of Discrete Time Systems–Discrete Convolution: Linear and Circular–Correlation

UNIT II ANALYSIS OF LTI DISCRETE TIME SIGNALS AND SYSTEMS 9

Analysis of LTI Discrete Time Systems using DFT–Properties of DFT–Inverse DFT– Analysis of LTI Discrete Time Systems using FFT Algorithms– Inverse DFT using FFT Algorithm.

UNIT III INFINITE IMPULSE RESPONSE FILTERS 9

Frequency response of Analog and Digital IIR filters–Realization of IIR filter–Design of analog low pass filter–Analog to Digital filter Transformation using Bilinear Transformation and Impulse Invariant method–Design of digital IIR filters (LPF, HPF, BPF, and BRF) using various transformation techniques.

UNIT IV FINITE IMPULSE RESPONSE FILTERS 9

Linear Phase FIR filter–Phase delay–Group delay–Realization of FIR filter–Design of Causal and Non- causal FIR filters (LPF, HPF, BPF and BRF) using Window method (Rectangular, Hamming window, Hanning window) –Frequency Sampling Technique.

UNIT V APPLICATIONS OF DSP 9

Multirate Signal Processing: Decimation, Interpolation, Spectrum of the sampled signal – Processing of Audio and Radar signal.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Perform mathematical operations on signals.
- Understand the sampling theorem and perform sampling on continuous-time signals to get discrete time signal by applying advanced knowledge of the sampling theory.
- Transform the time domain signal into frequency domain signal and vice-versa.
- Apply the relevant theoretical knowledge to design the digital IIR/FIR filters for the given analog specifications.

TEXTBOOKS:

1. John G. Proakis & Dimitris G.Manolakis, ―Digital Signal Processing – Principles, Algorithms & Applications‖, Fourth Edition, Pearson Education / Prentice Hall, 2007.

REFERENCES:

1. Richard G. Lyons, ―Understanding Digital Signal Processing‖. Second Edition, Pearson Education.

2. A.V.Oppenheim, R.W. Schafer and J.R. Buck, ―Discrete-Time Signal Processing‖, 8th Indian Reprint, Pearson, 2004.
3. Emmanuel C.Ifeachor, & Barrie.W.Jervis, ―Digital Signal Processing‖, Second Edition, Pearson Education / Prentice Hall, 2002.
4. William D. Stanley, ―Digital Signal Processing‖, Second Edition, Reston Publications.

20150E75A **BIG DATA ANALYTICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To know the fundamental concepts of big data and analytics.
- To explore tools and practices for working with big data
- To learn about stream computing.
- To know about the research that requires the integration of large amounts of data

UNIT I INTRODUCTION TO BIG DATA 9

Evolution of Big data - Best Practices for Big data Analytics - Big data characteristics – Validating - The Promotion of the Value of Big Data - Big Data Use Cases- Characteristics of Big Data Applications - Perception and Quantification of Value -Understanding Big Data Storage - A General Overview of High- Performance Architecture - HDFS - MapReduce and YARN - Map Reduce Programming Model

9

UNIT II CLUSTERING AND CLASSIFICATION

Advanced Analytical Theory and Methods: Overview of Clustering - K-means - Use Cases - Overview of the Method - Determining the Number of Clusters - Diagnostics - Reasons to Choose and Cautions .- Classification: Decision Trees - Overview of a Decision Tree - The General Algorithm - Decision Tree Algorithms - Evaluating a Decision Tree - Decision Trees in R - Naïve Bayes - Bayes‘ Theorem - Naïve Bayes Classifier.

UNIT III ASSOCIATION AND RECOMMENDATION SYSTEM 9

Advanced Analytical Theory and Methods: Association Rules - Overview - Apriori Algorithm - Evaluation of Candidate Rules - Applications of Association Rules - Finding Association& finding similarity - Recommendation System: Collaborative Recommendation- Content Based Recommendation - Knowledge Based Recommendation- Hybrid Recommendation Approaches.

UNIT IV STREAM MEMORY 9

Introduction to Streams Concepts – Stream Data Model and Architecture - Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream – Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform(RTAP) applications
- Case Studies - Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics

UNIT V NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION 9

NoSQL Databases : Schema-less Models‖: Increasing Flexibility for Data Manipulation-Key Value Stores- Document Stores - Tabular Stores - Object Data Stores - Graph Databases Hive - Sharding –- Hbase – Analyzing big data with twitter - Big data for E-Commerce Big data for blogs - Review of Basic Data Analytic Methods using R.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Work with big data tools and its analysis techniques
- Analyze data by utilizing clustering and classification algorithms
- Learn and apply different mining algorithms and recommendation systems for large data
- Perform analytics on data streams
- Learn NoSQL databases and management..

TEXTBOOKS:

Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets", Cambridge University Press, 2012.

2. David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph", Morgan Kaufmann/El sevier Publishers, 2013.

REFERENCES:

EMC Education Services, "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data", Wiley publishers, 2015.

2. Bart Baesens, "Analytics in a Big Data World: The Essential Guide to Data Science and its Applications", Wiley Publishers, 2015.
3. Dietmar Jannach and Markus Zanker, "Recommender Systems: An Introduction", Cambridge University Press, 2010.
4. Kim H. Pries and Robert Dunnigan, "Big Data Analytics: A Practical Guide for Managers " CRC Press, 2015.
5. Jimmy Lin and Chris Dyer, "Data-Intensive Text Processing with MapReduce", Synthesis Lectures on Human Language Technologies, Vol. 3, No. 1, Pages 1-177, Morgan Claypool publishers, 2010.

20150E75B **MACHINE LEARNING TECHNIQUES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the need for machine learning for various problem solving
- To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning
- To understand the latest trends in machine learning
- To design appropriate machine learning algorithms for problem solving

UNIT I INTRODUCTION 9

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II NEURAL NETWORKS AND GENETIC ALGORITHMS 9

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration - Labelled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity - Separability - Related Theorems.

UNIT III BAYESIAN AND COMPUTATIONAL LEARNING 9

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV INSTANT BASED LEARNING 9

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - hromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V ADVANCED LEARNING 9

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Differentiate between supervised, unsupervised, semi-supervised machine learning approaches
- Discuss the decision tree algorithm and indentity and overcome the problem of overfitting
- Discuss and apply the back propagation algorithm and genetic algorithms to various problems
- Apply the Bayesian concepts to machine learning
- Analyse and suggest appropriate machine learning approaches for various types of problems

TEXTBOOKS:

1. Tom M. Mitchell, ―Machine Learning‖, McGraw-Hill Education (India) Private Limited, 2013.

REFERENCES:

1. Ethem Alpaydin, ―Introduction to Machine Learning (Adaptive Computation and Machine Learning)‖, The MIT Press 2004.
2. Stephen Marsland, ―Machine Learning: An Algorithmic Perspective‖, CRC Press, 2009.

20150E75C **SOFTWARE PROJECT MANAGEMENT**

L	T	P	C
3	0	0	3

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 student should be able to:

- Understand Project Management principles while developing software.
- Gain extensive knowledge about the basic project management concepts, framework and the process models.
- Obtain adequate knowledge about software process models and software effort estimation techniques.
- Estimate the risks involved in various project activities.

- Define the checkpoints, project reporting structure, project progress and tracking mechanisms using project management principles.
- Learn staff selection process and the issues related to people management

TEXTBOOKS:

1. Bob Hughes, Mike Cotterell and Rajib Mall: Software Project Management – Fifth Edition, Tata McGraw Hill, New Delhi, 2012.

REFERENCES:

1. Robert K. Wysocki ―Effective Software Project Management‖ – Wiley Publication, 2011.
2. Walker Royce: ―Software Project Management‖- Addison-Wesley, 1998.
3. Gopalaswamy Ramesh, ―Managing Global Software Projects‖ – McGraw Hill Education
4. (India), Fourteenth Reprint 2013.

20150E75D **INTERNET OF THINGS** **L T P C**

3 0 0 3

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 Plant wide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL : 45 PERIODS

OUTCOMES:

At the end 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

TEXTBOOKS:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, ―Internet of Things – A hands-on approach‖, Universities Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols‖, Wiley, 2012 (for Unit 2).
3. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things‖, Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
6. https://www.arduino.cc/
7. https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

20150E75E **SERVICE ORIENTED ARCHITECTURE**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn fundamentals of XML
- To provide an overview of Service Oriented Architecture and Web services and their importance
- To learn web services standards and technologies
- To learn service oriented analysis and design for developing SOA based applications

UNIT I XML **9**

XML document structure – Well-formed and valid documents – DTD – XML Schema – Parsing XML using DOM, SAX – XPath - XML Transformation and XSL – Xquery

UNIT II SERVICE ORIENTED ARCHITECTURE (SOA) BASICS **9**

Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server and Distributed architectures —- Principles of Service Orientation – Service layers

UNIT III WEB SERVICES (WS) AND STANDARDS **8**

Web Services Platform – Service descriptions – WSDL – Messaging with SOAP – Service discovery – UDDI – Service-Level Interaction Patterns – Orchestration and Choreography

UNIT IV WEB SERVICES EXTENSIONS **8**

WS-Addressing - WS-ReliableMessaging - WS-Policy – WS-Coordination – WS -Transactions - WS- Security - Examples

UNIT V SERVICE ORIENTED ANALYSIS AND DESIGN 11

SOA delivery strategies – Service oriented analysis – Service Modelling – Service oriented design – Standards and composition guidelines -- Service design – Business process design – CaseStudy

TOTAL : 45 PERIODS

OUTCOMES:

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

- Understand XML technologies
- Understand service orientation, benefits of SOA
- Understand web services and WS standards
- Use web services extensions to develop solutions
- Understand and apply service modeling, service oriented analysis and design for application development

TEXTBOOKS:

1. Thomas Erl, ― Service Oriented Architecture: Concepts, Technology, and Design‖, Pearson Education, 2005
2. Sandeep Chatterjee and James Webber, ―Developing Enterprise Web Services: An Architect's Guide‖, Prentice Hall, 2004

REFERENCES:

1. James McGovern, Sameer Tyagi, Michael E Stevens, Sunil Mathew, ―Java Web Services Architecture‖, Elsevier, 2003.
2. Ron Schmelzer et al. ― XML and Web Services‖, Pearson Education, 2002.
3. Frank P.Coyle, ―XML, Web Services and the Data Revolution‖, Pearson Education,2002

20150E76A **MULTI-CORE ARCHITECTURES AND** *PROGRAMMING*

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the need for multi-core processors, and their architecture.
- To understand the challenges in parallel and multi-threaded programming.
- To learn about the various parallel programming paradigms,
- To develop multicore programs and design parallel solutions

UNIT I MULTI-CORE PROCESSORS **9**

Single core to Multi-core architectures – SIMD and MIMD systems – Interconnection networks - Symmetric and Distributed Shared Memory Architectures – Cache coherence - Performance Issues – Parallel program design.

UNIT II PARALLEL PROGRAM CHALLENGES **9**

Performance – Scalability – Synchronization and data sharing – Data races – Synchronization primitives (mutexes, locks, semaphores, barriers) – deadlocks and livelocks – communication between threads (condition variables, signals, message queues and pipes).

UNIT III SHARED MEMORY PROGRAMMING WITH OpenMP **9**

OpenMP Execution Model – Memory Model – OpenMP Directives – Work-sharing Constructs - Library functions – Handling Data and Functional Parallelism – Handling Loops - Performance Considerations.

UNIT IV DISTRIBUTED MEMORY PROGRAMMING WITH MPI **9**

MPI program execution – MPI constructs – libraries – MPI send and receive – Point-to-point and Collective communication – MPI derived datatypes – Performance evaluation

UNIT V PARALLEL PROGRAM DEVELOPMENT **9**

Case studies - n-Body solvers – Tree Search – OpenMP and MPI implementations and Comparison.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Describe multicore architectures and identify their characteristics and challenges.
- Identify the issues in programming Parallel Processors.
- Write programs using OpenMP and MPI.
- Design parallel programming solutions to common problems.
- Compare and contrast programming for serial processors and parallel processors.

TEXTBOOKS:

1. Peter S. Pacheco, ―An Introduction to Parallel Programming‖, Morgan-Kauffman/Elsevier, 2011.
2. Darryl Gove, ―Multicore Application Programming for Windows, Linux, and Oracle Solaris‖,Pearson, 2011 (unit 2)

REFERENCES:

1. Michael J Quinn, ―Parallel programming in C with MPI and OpenMP‖, Tata McGraw Hill,2003.
2. Victor Alessandrini, Shared Memory Application Programming, 1st Edition, Concepts and Strategies in Multicore Application Programming, Morgan Kaufmann, 2015.

20150E76B	HUMAN COMPUTER INTERACTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To learn the foundations of Human Computer Interaction.
- To become familiar with the design technologies for individuals and persons with disabilities.
- To be aware of mobile HCI.
- To learn the guidelines for user interface.

UNIT I FOUNDATIONS OF HCI 9

The Human: I/O channels – Memory – Reasoning and problem solving; The Computer: Devices– Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms. - Case Studies

UNIT II DESIGN & SOFTWARE PROCESS 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: SupervisoryControl and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III MODELS AND THEORIES 9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV MOBILE HCI 9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning– 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 WEB INTERFACE DESIGN 9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

TOTAL : 45 PERIODS

OUTCOMES:

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

- Design effective dialog for HCI
- Design effective HCI for individuals and persons with disabilities.
- Explain the HCI implications for designing multimedia/ ecommerce/ e-learning Web sites.
- Develop meaningful user interface.

TEXTBOOKS:

1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, ―Human Computer Interaction‖, 3rd Edition, Pearson Education, 2004 (UNIT I, II & III)
2. Brian Fling, ―Mobile Design and Development‖, First Edition, O‘Reilly Media Inc., 2009 (UNIT –IV)
3. 3. Bill Scott and Theresa Neil, ―Designing Web Interfaces‖, First Edition, O‘Reilly, 2009. (UNIT-V)

20150E76C **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 IoT PROTOCOLS 9

Delegates - Lambdas - Lambda Expressions - Events - Event Publisher - Event Listener - Strings and Regular Expressions - Generics - Collections - Memory Management and Pointers - Errors and Exceptions - Reflection

UNIT III DESIGN AND DEVELOPMENT 9

Diagnostics -Tasks, Threads and Synchronization - .Net Security - Localization - Manipulating XML- SAX and DOM - Manipulating files and the Registry- Transactions - ADO.NET- Peer-to-Peer Networking - PNRP - Building P2P Applications - Windows Presentation Foundation (WPF).

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES 9

Window based applications - Core ASP.NET- ASP.NET Web forms -Windows Communication Foundation (WCF)- Introduction to Web Services - .Net Remoting - Windows Service - Windows Workflow Foundation (WWF) - Activities – Workflows

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS 9

Assemblies - Shared assemblies - Custom Hosting with CLR Objects - 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:

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

- Write various applications using C# Language in the .NET Framework.
- Develop distributed applications using .NET Framework.
- Create mobile applications using .NET compact Framework.

TEXTBOOKS:

1. Christian Nagel, 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.

20150E76D **WIRELESS ADHOC AND SENSOR NETWORKS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn about the issues and challenges in the design of wireless ad hoc networks.
- To understand the working of MAC and Routing Protocols for ad hoc and sensor networks
- To learn about the Transport Layer protocols and their QoS for ad hoc and sensor networks.
- To understand various security issues in ad hoc and sensor networks and the corresponding solution

UNIT I MAC & ROUTING IN AD HOC NETWORKS 9

Introduction – Issues and challenges in ad hoc networks – MAC Layer Protocols for wireless ad hoc networks – Contention-Based MAC protocols – MAC Protocols Using Directional Antennas – Multiple- Channel MAC Protocols – Power-Aware MAC Protocols – Routing in Ad hoc Networks – Design Issues – Proactive, Reactive and Hybrid Routing Protocols

UNIT II TRANSPORT & QOS IN AD HOC NETWORKS 9

TCP"s challenges and Design Issues in Ad Hoc Networks – Transport protocols for ad hoc networks – Issues and Challenges in providing QoS – MAC Layer QoS solutions – Network Layer QoS solutions – QoS Model

UNIT III MAC & ROUTING IN WIRELESS SENSOR NETWORKS 9

Introduction – Applications – Challenges – Sensor network architecture – MAC Protocols for wireless sensor networks – Low duty cycle protocols and wakeup concepts – Contention- Based protocols – Schedule-Based protocols – IEEE 802.15.4 Zigbee – Topology Control – Routing Protocols

UNIT IV TRANSPORT & QOS IN WIRELESS SENSOR NETWORKS 9

Data-Centric and Contention-Based Networking – Transport Layer and QoS in Wireless Sensor Networks – Congestion Control in network processing – Operating systems for wireless sensor networks – Examples

UNIT V SECURITY IN AD HOC AND SENSOR NETWORKS 9

Security Attacks – Key Distribution and Management – Intrusion Detection – Software based Anti-tamper techniques – Water marking techniques – Defense against routing attacks - Secure Ad hoc routing protocols – Broadcast authentication WSN protocols – TESLA – Biba – Sensor Network Security Protocols – SPINS

TOTAL : 45 PERIODS

OUTCOMES:

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

- Identify different issues in wireless ad hoc and sensor networks
- To analyze protocols developed for ad hoc and sensor networks
- To identify and understand security issues in ad hoc and sensor networks.

TEXTBOOKS:

1. C.Siva Ram Murthy and B.S.Manoj, ―Ad Hoc Wireless Networks – Architectures and 2 Protocols‖, Pearson Education, 2006.

2. Holger Karl, Andreas Willing, ―Protocols and Architectures for Wireless Sensor Networks‖, John Wiley & Sons, Inc., 2005.

REFERENCES:

1. Subir Kumar Sarkar, T G Basavaraju, C Puttamadappa, ―Ad Hoc Mobile Wireless Networks Auerbach Publications, 2008.

2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, ―Ad Hoc and Sensor Networks: Theory and Applications (2nd Edition)‖, World Scientific Publishing, 2011.

3. Waltenegus Dargie, Christian Poellabauer, ―Fundamentals of Wireless Sensor Networks Theory and Practice‖, John Wiley and Sons, 2010

4. Xiang-Yang Li , "Wireless Ad Hoc and Sensor Networks: Theory and Applications‖, 1227 th edition, Cambridge university Press,2008.

20150E76E	ADVANCED TOPICS ON DATABASES	L	T	P	C
		3	0	0	3

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:

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

- 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.

TEXTBOOKS:

1. Ramez Elmasri, Shamkant B. Navathe, ―Fundamentals of Database Systems‖, Sixth Edition Pearson, 2011.

2. Thomas Cannolly and Carolyn Begg, ―Database Systems, A Practical Approach to Design, Implementation and Management‖, Fourth Edition, Pearson Education, 2008.

REFERENCES:

1. Henry F Korth, Abraham Silberschatz, S. Sudharshan, ―Database System Concepts‖, Sixth Edition, McGraw Hill, 2011.

2. C.J.Date, A.Kannan, S.Swamynathan, ―An Introduction to Database Systems‖, Eighth Edition, Pearson Education, 2006.

3. Carlo Zaniolo, Stefano Ceri, Christos Faloutsos, Richard T.Snodgrass, V.S.Subrahmanian, Roberto Zicari, ―Advanced Database Systems‖, Morgan Kaufmann publishers,2006.

20150E81A	DIGITAL IMAGE PROCESSING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To become familiar with digital image fundamentals
- To get exposed to simple image enhancement techniques in Spatial and Frequency domain.
- To learn concepts of degradation function and restoration techniques.
- To study the image segmentation and representation techniques.
- To become familiar with image compression and recognition methods

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels - Color image fundamentals - RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms - DFT, DCT.

UNIT II IMAGE ENHANCEMENT 9

Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering– Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform– Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.

UNIT III IMAGE RESTORATION 9

Image Restoration - degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering

UNIT IV IMAGE SEGMENTATION 9

Edge detection, Edge linking via Hough transform – Thresholding - Region based segmentation – Region growing – Region splitting and merging – Morphological processing- erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.

UNIT V IMAGE COMPRESSION AND RECOGNITION 9

Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture - Patterns and Pattern classes - Recognition based on matching.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Know and understand the basics and fundamentals of digital image processing, such as digitization, sampling, quantization, and 2D-transforms.
- Operate on images using the techniques of smoothing, sharpening and enhancement.
- Understand the restoration concepts and filtering techniques.
- Learn the basics of segmentation, features extraction, compression and recognition methods for color models.

TEXTBOOKS:

1. Rafael C. Gonzalez, Richard E. Woods, _Digital Image Processing', Pearson, Third Edition, 2010.
2. Anil K. Jain, _Fundamentals of Digital Image Processing', Pearson, 2002.

REFERENCES:

1. Kenneth R. Castleman, _Digital Image Processing', Pearson, 2006.
2. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, _Digital Image Processing using MATLAB', Pearson Education, Inc., 2011.
3. D,E. Dudgeon and RM. Mersereau, _Multidimensional Digital Signal Processing', Prentice Hall Professional Technical Reference, 1990.
4. William K. Pratt, _Digital Image Processing', John Wiley, New York, 2002
5. Milan Sonka et al _Image processing, analysis and machine vision', Brookes/Cole, Vikas Publishing House, 2nd edition, 1999

20150E81B **Social Network Analysis**

L	T	C	P
3	0	0	3

OBJECTIVES

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

UNIT I INTRODUCTION **9**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION **9**

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS **9**

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi- Relational characterization of dynamic social network communities.

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES **9**

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS **9**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks

TEXTBOOKS:

1. Peter Mika, ―Social Networks and the Semantic Web‖, First Edition, Springer 2007.
2. Borko Furht, ―Handbook of Social Network Technologies and Applications‖, 1st Edition, Springer, 2010.

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li, ―Web Mining and Social Networking – Techniques and applications‖, First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, ―Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively‖, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, ―Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling‖, IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, ―The Social Semantic Web‖, Springer,2009.

20150E81C **INFORMATION SECURITY** **L T P C**

3 0 0 3

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 the course, the student should be able to:

- Discuss the basics of information security
- Illustrate the legal, ethical and professional issues in information security
- Demonstrate the aspects of risk management.
- Become aware of various standards in the Information Security System
- Design and implementation of Security Techniques.

TEXTBOOKS:

1. Michael E Whitman and Herbert J Mattord, ―Principles of Information Security‖, Vikas Publishing House, New Delhi, 2003

REFERENCES:

1. Micki Krause, Harold F. Tipton, ― Handbook of Information Security Management‖, Vol 1-3 CRCPress 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.

20150E81D **CYBER FORENSICS** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn computer forensics
- To become familiar with forensics tools
- To learn to analyze and validate forensics data.

UNIT I INTRODUCTION TO COMPUTER FORENSICS 9

Introduction to Traditional Computer Crime, Traditional problems associated with Computer Crime. Introduction to Identity Theft & Identity Fraud. Types of CF techniques - Incident and incident response methodology - Forensic duplication and investigation. Preparation for IR: Creating response tool kit and IR team. - Forensics Technology and Systems - Understanding Computer Investigation – Data Acquisition.

UNIT II EVIDENCE COLLECTION AND FORENSICS TOOLS 9

Processing Crime and Incident Scenes – Working with Windows and DOS Systems.Current Computer Forensics Tools: Software/ Hardware Tools.

UNIT III ANALYSIS AND VALIDATION 9

Validating Forensics Data – Data Hiding Techniques – Performing Remote Acquisition – Network Forensics – Email Investigations – Cell Phone and Mobile Devices Forensics

UNIT IV ETHICAL HACKING 9

Introduction to Ethical Hacking - Footprinting and Reconnaissance - Scanning Networks - Enumeration - System Hacking - Malware Threats - Sniffing.

UNIT V ETHICAL HACKING IN WEB 9

Social Engineering - Denial of Service - Session Hijacking - Hacking Web servers – Hacking Web Applications – SQL Injection - Hacking Wireless Networks - Hacking Mobile Platforms.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Understand the basics of computer forensics
- Apply a number of different computer forensic tools to a given scenario
- Analyze and validate forensics data
- Identify the vulnerabilities in a given network infrastructure
- Implement real-world hacking techniques to test system security.

TEXTBOOKS:

1. Bill Nelson, Amelia Phillips, Frank Enfinger, Christopher Steuart, ―Computer Forensics and Investigations‖, Cengage Learning, India Edition, 2016.
2. CEH official Certfied Ethical Hacking Review Guide, Wiley India Edition, 2015.

REFERENCES:

1. John R.Vacca, ―Computer Forensics‖, Cengage Learning, 2005
2. MarjieT.Britz, ―Computer Forensics and Cyber Crime‖: An Introduction‖, 3rd Edition, Prentice Hall, 2013.
3. AnkitFadia ― Ethical Hacking‖ Second Edition, Macmillan India Ltd, 2006
4. Kenneth C.Brancik ―Insider Computer Fraud‖ Auerbach Publications Taylor &amp Francis Group–2008.

20150E81E **SOFT COMPUTING**

L	T	P	C
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OBJECTIVES:

- To learn the basic concepts of Soft Computing
- To become familiar with various techniques like neural networks, genetic algorithms and fuzzy systems.
- To apply soft computing techniques to solve problems.

UNIT I INTRODUCTION TO SOFT COMPUTING 9

Introduction-Artificial Intelligence-Artificial Neural Networks-Fuzzy Systems-Genetic Algorithm and Evolutionary Programming-Swarm Intelligent Systems-Classification of ANNs-McCulloch and Pitts Neuron Model-Learning Rules: Hebbian and Delta- Perceptron Network-Adaline Network-Madaline Network.

UNIT II ARTIFICIAL NEURAL NETWORKS 9

Back propagation Neural Networks - Kohonen Neural Network -Learning Vector Quantization -Hamming Neural Network - Hopfield Neural Network- Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks- Support Vector Machines - Spike Neuron Models.

UNIT III FUZZY SYSTEMS 9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions -Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making.

UNIT IV GENETIC ALGORITHMS 9

Basic Concepts- Working Principles -Encoding- Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion -Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm.

UNIT V HYBRID SYSTEMS 9

Hybrid Systems -Neural Networks, Fuzzy Logic and Genetic -GA Based Weight Determination - LR-Type Fuzzy Numbers - Fuzzy Neuron - Fuzzy BP Architecture - Learning in Fuzzy BP- Inference by Fuzzy BP - Fuzzy ArtMap: A Brief Introduction - Soft Computing Tools - GA in Fuzzy Logic Controller Design - Fuzzy Logic Controller

TOTAL : 45 PERIODS

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

- Apply suitable soft computing techniques for various applications.
- Integrate various soft computing techniques for complex problems.

TEXTBOOKS:

1. N.P.Padhy, S.P.Simon, "Soft Computing with MATLAB Programming", Oxford University Press, 2015.
2. S.N.Sivanandam , S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt. Ltd., 2nd Edition, 2011.
3. S.Rajasekaran, G.A.Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications ", PHI Learning Pvt. Ltd., 2017.

REFERENCES:

1. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, ―Neuro-Fuzzy and Soft Computing‖, Prentice-Hall of India, 2002.
2. Kwang H.Lee, ―First course on Fuzzy Theory and Applications‖, Springer, 2005.
3. George J. Klir and Bo Yuan, ―Fuzzy Sets and Fuzzy Logic-Theory and Applications‖, Prentice Hall, 1996.
4. James A. Freeman and David M. Skapura, ―Neural Networks Algorithms, Applications, and Programming Techniques‖, Addison Wesley, 2003.

20150E82A **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:

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

- Use an open source search engine framework and explore its capabilities
- Apply appropriate method of classification or clustering.
- Design and implement innovative features in a search engine.
- Design and implement a recommender system.

TEXTBOOKS:

1. 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.

20150E82B **NATURAL LANGUAGE PROCESSING** **L T P C**

3 0 0 3

OBJECTIVES:

- To learn the fundamentals of natural language processing
- To understand the use of CFG and PCFG in NLP
- To understand the role of semantics of sentences and pragmatics
- To apply the NLP techniques to IR applications

UNIT I INTRODUCTION 9

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State Automata – English Morphology, Transducers for lexicon and rules, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

UNIT II WORD LEVEL ANALYSIS 9

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part- of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Issues in PoS tagging – Hidden Markov and Maximum Entropy models.

UNIT III SYNTACTIC ANALYSIS 9

Context-Free Grammars, Grammar rules for English, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing – Shallow parsing – Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

UNIT IV SEMANTICS AND PRAGMATICS 10

Requirements for representation, First-Order Logic, Description Logics – Syntax-Driven Semantic analysis, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

UNIT V DISCOURSE ANALYSIS AND LEXICAL RESOURCES 8

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC)

TOTAL : 45 PERIODS

OUTCOMES:

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

- To tag a given text with basic Language features
- To design an innovative application using NLP components
- To implement a rule based system to tackle morphology/syntax of a language
- To design a tag set to be used for statistical processing for real-time applications
- To compare and contrast the use of different statistical approaches for different types of NLP applications.

TEXTBOOKS:

1. 1.Daniel Jurafsky, James H. Martin―Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech, Pearson Publication, 2014.
2. Steven Bird, Ewan Klein and Edward Loper, ―Natural Language Processing with
3. Python‖, First Edition, O‗Reilly Media, 2009.

REFERENCES:

1. Breck Baldwin, ―Language Processing with Java and LingPipe Cookbook, Atlantic Publisher, 2015.
2. Richard M Reese, ―Natural Language Processing with Java‖, O‗Reilly Media, 2015.
3. Nitin Indurkhya and Fred J. Damerau, ―Handbook of Natural Language Processing, Second Edition, Chapman and Hall/CRC Press, 2010.
4. Tanveer Siddiqui, U.S. Tiwary, ―Natural Language Processing and Information Retrieval‖, Oxford University Press, 2008.

20150E82C	PARALLEL ALGORITHMS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand different parallel architectures and models of computation.
- To introduce the various classes of parallel algorithms.
- To study parallel algorithms for basic problems.

UNIT I INTRODUCTION 9

Need for Parallel Processing - Data and Temporal Parallelism - Models of Computation - RAM and PRAM Model – Shared Memory and Message Passing Models- Processor Organisations - PRAM Algorithm – Analysis of PRAM Algorithms- Parallel Programming Languages.

UNIT II PRAM ALGORITHMS 9

Parallel Algorithms for Reduction – Prefix Sum – List Ranking –Preorder Tree Traversal – Searching - Sorting - Merging Two Sorted Lists – Matrix Multiplication - Graph Coloring - Graph Searching.

UNIT III SIMD ALGORITHMS -I 9

2D Mesh SIMD Model - Parallel Algorithms for Reduction - Prefix Computation - Selection - Odd-Even Merge Sorting - Matrix Multiplication.

UNIT IV SIMD ALGORITHMS -II 9

Hypercube SIMD Model - Parallel Algorithms for Selection- Odd-Even Merge Sort- Bitonic Sort- Matrix Multiplication Shuffle Exchange SIMD Model - Parallel Algorithms for Reduction -Bitonic Merge Sort - Matrix Multiplication - Minimum Cost Spanning Tree

UNIT V MIMD ALGORITHMS 9

UMA Multiprocessor Model -Parallel Summing on Multiprocessor- Matrix Multiplication on Multiprocessors and Multicomputer - Parallel Quick Sort - Mapping Data to Processors.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Develop parallel algorithms for standard problems and applications.
- Analyse efficiency of different parallel algorithms.

TEXTBOOKS:

1. Michael J. Quinn, "Parallel Computing : Theory & Practice", Tata McGraw Hill Edition, Second edition, 2017.
2. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", University press, Second edition , 2011.
3. V Rajaraman, C Siva Ram Murthy, " Parallel computers- Architecture and Programming ", PHI learning, 2016.

REFERENCES:

1. Ananth Grame, George Karpis, Vipin Kumar and Anshul Gupta, "Introduction to Parallel Computing", 2nd Edition, Addison Wesley, 2003.
2. M Sasikumar, Dinesh Shikhare and P Ravi Prakash , " Introduction to Parallel Processing", PHI learning , 2013.
3. S.G.Akl, "The Design and Analysis of Parallel Algorithms", PHI, 1989.

20150E82D **SPEECH PROCESSING** **L T P C**

3 0 0 3

OBJECTIVES:

- To understand the fundamentals of the speech processing
- Explore the various speech models
- Gather knowledge about the phonetics and pronunciation processing
- Perform wavelet analysis of speech
- To understand the concepts of speech recognition

UNIT I INTRODUCTION 9

Introduction - knowledge in speech and language processing - ambiguity - models and algorithms - language - thought - understanding - regular expression and automata - words & transducers – N grams

UNIT II SPEECH MODELLING 9

Word classes and part of speech tagging – hidden markov model – computing likelihood: the forward algorithm – training hidden markov model – maximum entropy model – transformation-based tagging – evaluation and error analysis – issues in part of speech tagging – noisy channel model for spelling.

UNIT III SPEECH PRONUNCIATION AND SIGNAL PROCESSING 9

Phonetics - speech sounds and phonetic transcription - articulatory phonetics - phonological categories and pronunciation variation - acoustic phonetics and signals - phonetic resources - articulatory and gestural phonology

UNIT IV SPEECH IDENTIFICATION 9

Speech synthesis - text normalization - phonetic analysis - prosodic analysis – diphone waveform synthesis - unit selection waveform synthesis - evaluation

UNIT V SPEECH RECOGNITION 9

Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training - multipass decoding: n-best lists and lattices- a* (‗stack') decoding - context-dependent acoustic models: triphones - discriminative training - speech recognition by humans.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Create new algorithms with speech processing
- Derive new speech models
- Perform various language phonetic analysis
- Create a new speech identification system
- Generate a new speech recognition system

TEXTBOOKS:

1. Daniel Jurafsky and James H. Martin, ― Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition‖, Person education,2013.

REFERENCES:

1. Kai-Fu Lee, ―Automatic Speech Recognition‖, The Springer International Series in Engineering and Computer Science, 1999.
2. Himanshu Chaurasiya, ―Soft Computing Implementation of Automatic Speech Recognition‖, LAP Lambert Academic Publishing, 2010.
3. Claudio Becchetti, Klucio Prina Ricotti, ―Speech Recognition: Theory and C++ Implementation Wiley publications 2008.
4. **Ikrami Eldirawy , Wesam Ashour, ―Visual Speech Recognition‖, Wiley publications , 2011**

20150E82E FUNDAMENTALS OF NANO SCIENCE L T P C

3 0 0 3

OBJECTIVE:

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

UNIT I INTRODUCTION 8

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

UNIT II GENERAL METHODS OF PREPARATION 9

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

UNIT III NANOMATERIALS 12

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

UNIT IV CHARACTERIZATION TECHNIQUES 9

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

UNIT V APPLICATIONS 7

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

TOTAL : 45 PERIODS

OUTCOMES:

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

- Familiarize about the science of nanomaterials
- Ddemonstrate the preparation of nanomaterials
- Ddevelop knowledge in characteristic nanomaterial

TEXTBOOKS:

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,
3. Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES:

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

LIST OF FREE ELECTIVE - I

20150FE54B **CLOUD COMPUTING**

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

OBJECTIVES:

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

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

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

UNIT II VIRTUALIZATION 9

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

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – 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:

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.

20150FE54A **DATABASE MANAGEMENT SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

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

UNIT II DATABASE QUERYING **11**

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

UNIT III DATABASE PROGRAMMING **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.

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 Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.

20152FE54A **BASICS OF BIOMEDICAL INSTRUMENTATION**

L	T	P	C
3	0	0	3

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 ELECTRODECONFIGURATIONS 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-ELECTRICALPARAMETERS 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 physiogical 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.

20152FE54B	SENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS **9**

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V ALTERNATIVE ENERGY SOURCES 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

OUTCOMES:

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

Expertise in various calibration techniques and signal types for sensors. CO2. Apply the various sensors in the Automotive and Mechatronics applications CO3. Study the basic principles of various smart sensors. CO4. Implement the DAQ systems with different sensors for real time applications

-

TEXTBOOKS:

Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.

2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCES:

1. Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.

2. John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford Science Publications, 1999.

3. Richard Zurawski, “Industrial Communication Technology Handbook” 2nd edition, CRC Press, 2015.

20153FE54A **INDUSTRIAL NANOTECHNOLOGY**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I NANO ELECTRONICS 9

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

UNIT II BIONANOTECHNOLOGY 9

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

UNIT III TRANSMISSION SYSTEMS 9

Nanocatalyts – 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 Mieusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems,Wiley Publishers (2010).
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).
4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai,Polymer Nano composites, Woodhead publishing, (2006).
7. W.N. Chang,Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

20153FE54B **ENERGY CONSERVATION AND MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:

Understand and analyse the energy data of industries

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

UNIT I INTRODUCTION 9

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

UNIT II ELECTRICAL SYSTEMS 9

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

UNIT III THERMAL SYSTEMS 9

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

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

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

UNIT V ECONOMICS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

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

20154FE54A **RENEWABLE ENERGY SOURCES**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I PRINCIPLES OF SOLAR RADIATION 10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled 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

20154FE54B **AUTOMOTIVE SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

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

UNIT II VEHICLE FRAMES AND STEERING SYSTEM **9**

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

UNIT III TRANSMISSION SYSTEMS **9**

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

UNIT IV SUSPENSION AND BRAKES SYSTEMS **9**

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

UNIT V ALTERNATIVE ENERGY SOURCES **9**

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

TOTAL **: 45 PERIODS**

OUTCOMES:

At the end of the course, the 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:

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

REFERENCES:

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

20155FE54A **AIR POLLUTION AND CONTROL ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I NTRODUCTION 7

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

UNIT II METEOROLOGY 6

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

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

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

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

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

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

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.

20155FE54B **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

LIST OF FREE ELECTIVE - II

20150FE74A **INTRODUCTION TO C PROGRAMMING**

L	T	P	C
3	0	0	3

OBJECTIVES

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

UNIT I INTRODUCTION **9**

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

UNIT II ARRAYS **9**

Introduction to Arrays – One dimensional arrays: Declaration – Initialization - Accessing elements – Operation s: 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: Reema Thareja (Chapters 5)

UNIT III STRINGS **9**

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

UNIT IV FUNCTIONS **9**

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

UNIT V STRUCTURES **9**

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

TOTAL: 45 PERIODS

OUTCOMES

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

- Develop simple applications using basic constructs
- Develop applications using arrays and strings
- Develop applications using functions and structures

TEXT BOOK

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

REFERENCES:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2006
2. Paul Deitel and Harvey Deitel, “C How to Program”, Seventh edition, Pearson Publication
3. Juneja, B. L and Anita Seth, “Programming in C”, CENGAGE Learning India pvt. Ltd., 2011

20150FE74B **DATA STRUCTURES AND ALGORITHMS** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I ALGORITHM ANALYSIS, LIST ADT 11

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

UNIT II STACKS AND QUEUES 7

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

UNIT III SEARCHING AND SORTING ALGORITHMS 10

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

UNIT IV TREES 9

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

UNIT V GRAPHS 8

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

20152FE74A **ROBOTICS** **L T P C**
3 0 0 3

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 Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION **12**

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual 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-Various 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., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003. 2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.

20152FE74B **ELECTRONIC DEVICES** **L T P C**

3 0 0 3

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- Gummel Poonmodel, 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 diodeZener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

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

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

TOTAL: 45 PERIODS

OUTCOMES:

After this course, the student should be able to:

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

TEXT BOOKS:

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

REFERENCES:

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

20153FE74A **BASIC CIRCUIT THEORY** **L T P C**
3 0 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS **9**

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS **9**

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNITIII AC CIRCUITS **9**

Introduction to AC circuits , inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV THREE PHASE CIRCUITS **9**

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS **9**

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to introduce electric circuits and its analysis
- Ability to impart knowledge on solving circuit equations using network theorems
- Ability to introduce the phenomenon of resonance in coupled circuits.
- Ability to introduce Phasor diagrams and analysis of three phase circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits",Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw- Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.
5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.

20153FE74B INTRODUCTION TO RENEWABLE ENERGY SYSTEMS **L T P C**
3 0 0 3

OBJECTIVES:
To Provide knowledge

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

UNIT I INTRODUCTION 9

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

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

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

UNIT III POWER CONVERTERS 9

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

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9

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

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOK:

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

REFERENCES:

1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variability speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, „Introduction to Modern Power Electronics‟, Second edition, wiley India Pvt. Ltd, 2012.

20154FE74A **INDUSTRIAL SAFETY** **L T P C**
3 0 0 3

OBJECTIVES :

To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION **9**

Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS **9**

Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL **9**

Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS **9**

System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

UNIT V SAFETY REGULATIONS **9**

Explosions – Disaster management – catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety – case studies
.

TOTAL : 45 PERIODS

OUTCOMES:

- Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management

.
TEXT BOOK:

1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCES:

1. Safety Manual, “EDEL Engineering Consultancy”, 2000.
2. David L.Goetsch, “Occupational Safety and Health for Technologists”, 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

20**154FE74B** **TESTING OF MATERIALS** **L T P C**
3 0 0 3

OBJECTIVE:

To understand the various destructive and non destructive testing methods of materials and its industrial applications.

UNIT I INTRODUCTION TO MATERIALS TESTING 9

Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNIT II MECHANICAL TESTING 9

Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy)
- Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NON DESTRUCTIVE TESTING 9

Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission- Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING 9

Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING 9

Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS

OUTCOMES:

- Identify suitable testing technique to inspect industrial component
- Ability to use the different technique and know its applications and limitations

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu "Practical Non-Destructive Testing", Narosa Publishing House, 2009.
2. Cullity, B. D., "Elements of X-ray diffraction", 3rd Edition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, "The Mechanical Testing of Metals and Alloys" 7th Edition, Cousens Press, 2007.

REFERENCES:

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9 Edition, American Society for Metals, 1978.
2. ASM Metals Handbook, "Non-Destructive Evaluation and Quality Control", American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA, 1986.

20155FE74A **GREEN BUILDING DESIGN** **L T P C**
3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS
9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45

PERIODS TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. **New Age International, 2007.**
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009. 3. Sustainable Building Design **Manual. Vol 1 and 2, Teri, New Delhi, 2004.**

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

20155FE74B **WASTE WATER TREATMENT** **L T P C**
3 0 0 3

OBJECTIVES

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

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT **9**

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

UNIT II INDUSTRIAL WATER TREATMENT **9**

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

UNIT III CONVENTIONAL TREATMENT METHODS **9**

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

UNIT IV WASTEWATER TREATMENT **9**

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

UNIT V ADSORPTION AND OXIDATION PROCESSES **9**

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

TOTAL: 45 PERIODS

OUTCOMES

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

TEXTBOOKS:

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

REFERENCES

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

*Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence and changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching-research relations, the following framework has been developed and widely adopted to help individual staff member, course teams and whole institutions analyze their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research

Level 2: Bounded Research

Level 3: Scaffolded Research

Level 4: Self actuated Research

Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the B .Tech.[CSE) curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
IV	Research Led Seminar	1
V	Research Methodology	3
VI	Participation in Bounded Research	2
VII	Design Project/ Socio Technical Project (Scaffolded Research)	4
VIII	Project Work	10

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment:** **40 Marks**
    - Seminar Report (UG)/Concept Note(PG) : 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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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.

MAPPING OF PEO WITH PO

PEO	PROGRAM OUTCOMES										
	a	**b**	**C**	**d**	**e**	**f**	**g**	**h**	**i**	**j**	**k**
I	X	X		X	X						
II			X					X			
III							X				X
IV									X	X	
V						X					

COURSE STRUCTURE

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
Total No. of credits					**18**

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
Total No. of credits					**18**

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
Total No. of credits					**18**

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
Total No. of credits					**20**

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**
Total Credits								**130**

TOTAL CREDITS	
Semester – I	**19**
Semester – II	**19**
Semester – III	**18**
Semester – IV	**18**
Semester – V	**18**
Semester – VI	**18**
Semester – VI	**20**
TOTAL CREDITS	**130**

SYLLABI

CSE/Sem I

17148S11P - TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

AIM:

To develop the skills for the students in the areas of Transforms and Partial Differtial 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

17152S12P - DIGITAL SYSTEMS

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 LOGIC GATES 9 +3

Binary, Octal, Decimal, Hexadecimal-Number base conversions – complements – signed Binary numbers. Binary Arithmetic- Binary codes -Boolean postulates and laws –De-Morgan's Theorem-Principle of Duality- Boolean expression – Boolean function- Minimization of Boolean expressions– Karnaugh map Minimization .
LOGIC GATES: AND, OR, NOT, NAND, NOR, Exclusive – OR and Exclusive – NOR-Implementations of Logic Functions using gates, NAND –NOR implementations

UNIT II. COMBINATIONAL CIRCUITS 9 +3

Adders-Subtractors – Serial adder/ Subtractor - Parallel adder/ Subtractor-Carry look ahead adder- Multiplexer/ De multiplexer- Implementation using MUX- encoder / decoder – parity checker –code converters

UNIT III SEQUENTIAL CIRCUIT 9 +3

Flip flops SR, JK, T, D and Master slave – Characteristic table and equation –Application table – Edge triggering-Level triggering-Realization of one flip flop using other flip flops-Asynchronous / Ripple counters – Synchronous counters –Modulo – n counter –Classification of sequential circuits – Introduction to shift registers

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS 9 +3

Introduction to asynchronous sequential circuits - primitive state / flow table – Minimization of primitive state table –state assignment – Excitation table – Excitation map- cycles – Races – Hazards: Static –Dynamic –Essential –Hazards elimination.

UNIT V MEMORY DEVICES 9 +3

Classification of memories –RAM organization – Write/Read operation – Memory cycle - Timing wave forms –memory decoding- memory expansion- Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell –Dynamic RAM cell –ROM organization - PROM –EPROM –EEPROM – EAPROM – Programmable Logic Devices –Implementation using ROM- Field Programmable Gate Arrays (FPGA)

TOTAL:60hrs

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, 2nd ed., Vikas Publishing House Pvt. Ltd, New Delhi, 2004
2. Charles H.Roth. “Fundamentals of Logic Design”, Thomson Publication Company, 2003.
3. Donald P.Leach and Albert Paul Malvino, Digital Principles and Applications, 5 ed., Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
4. R.P.Jain, Modern Digital Electronics, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
5. Thomas L. Floyd, Digital Fundamentals, Pearson Education, Inc, New Delhi, 2003

17150H13P - 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:

1. R.G.Dromey, "How to solve it by computer", Prentice- Hall of India, 2002.
2. Aaron M. Tenenbaum, Yeedidyah Langsam, Moshe J. Augenstein, 'Data structures using C', Pearson Education, 2004 / PHI.
3. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nd ed, Pearson Education Asia, 2002

REFERENCES:

1. E. Balagurusamy, 'Programming in Ansi C', Second Edition, Tata McGraw Hill Publication, 2003.
2. Robert L. Kruse, Bruce P. Leung Clovis L.Tondo, 'Data Structures and Program Design in C', Pearson Education, 2000 / PHI.
3. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, "Data Structures using C", Pearson Education Asia, 2004.
4. Richard F. Gilberg, Behrouz A. Forouzan, "Data Structures – A Pseudocode Approach with C", Thomson Brooks / COLE, 1998.
5. Aho, J. E. Hopcroft and J. D. Ullman, "Data Structures and Algorithms", Pearson education Asia, 1983.

17150H14P –COMPUTER ARCHITECTURE AND ORGANIZATION

AIM:

To understand the basic structure and organization of digital computer.

OBJECTIVES:

- To have a thorough understanding of operation of a digital computer.
- To list the operation of the arithmetic unit .
- To study in detail the different types of control and the concept of pipelining.
- To understand the hierarchy of memories.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I *BASIC STRUCTURE OF COMPUTERS* *10+3*

Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language

UNIT II *ARITHMETIC UNIT* *8+3*

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division

UNIT III *BASIC PROCESSING UNIT* *9+3*

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed 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^{th} Edition "Computer Organization", McGraw-Hill, 2002.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6^{th} Edition, Pearson Education, 2003.
2. David A. Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2^{nd} Edition, Morgan Kaufmann, 2002.
3. John P.Hayes, "Computer Architecture and Organization", 3^{rd} Edition, McGraw Hill, 1998.

17150H15P - OBJECT ORIENTED PROGRAMMING

AIM:

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.

CSE/Sem II

17148S21P -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

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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.

CSE/Sem II

17150H22P - MICROPROCESSORS AND INTERFACING

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^{th} Edition, Penram International Publishing, New Delhi, 2000. (Unit I, II)
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3. S.P.Chowdhury , Sunetra Chowdhury,Microprocessor & Peripherals ,First Edition ,Scitech Publications(INDIA)Pvt. Ltd.(Unit V)

REFERENCES:

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000(Unit III,IV).
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2^{nd} 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.

17150H23P -DATABASE MANAGEMENT SYSTEMS

AIM:

To know the methodologies in database technology and an introduction to the current trends in this field.

OBJECTIVES:

- To learn the fundamentals of data models .
- To understand the internal storage structures using different file and indexing techniques.
- To know the fundamental concepts of transaction processing- concurrency control techniques and recovery procedure.
- To understand the basic concepts of the emerging trends in the area of distributed DB- and OODB.

UNIT I INTRODUCTION AND CONCEPTUAL MODELING 9 + 3

Introduction to File and Database systems- Database system structure – Data Models – Introduction to Network and Hierarchical Models – ER model – Relational Model – Relational Algebra and Calculus.

UNIT II RELATIONAL MODEL 9 + 3

SQL – Data definition- Queries in SQL- Updates- Views – Integrity and Security – Relational Database design – Functional dependences and Normalization for Relational Databases (up to BCNF).

UNIT III DATA STORAGE AND QUERY PROCESSING 9 + 3

Primary file organization- Secondary storage Devices- Operations on Files- Heap File- Sorted Files- Hashing Techniques – Index Structure for files –Different types of Indexes- B-Tree - Query Processing.

UNIT IV TRANSACTION MANAGEMENT 9 + 3

Transaction Processing – Introduction- Need for Concurrency control- Schedule and Recoverability- Serializability and Schedules – Concurrency Control – Types of Locks- Two Phases locking- Deadlock- Time stamp based concurrency control – Recovery Techniques – Concepts- Immediate Update- Deferred Update - Shadow Paging.

UNIT V *CURRENT TRENDS* *9 + 3*

Object Oriented Databases – Need for Complex Data types- OO data Model- Nested relations- Complex Types- Inheritance Reference Types - Distributed databases- Homogenous and Heterogeneous- Distributed data Storage.

TOTAL: 60 Hrs.

TEXT BOOKS:

1. Abraham Silberschatz, Henry F. Korth and S. Sudarshan- "Database System Concepts", Fourth Edition, McGraw-Hill, 2002.

REFERENCES:

1. Ramez Elmasri and Shamkant B. Navathe, "Fundamental Database Systems", Third Edition, Pearson Education, 2003.
2. Raghu Ramakrishnan, "Database Management System", Tata McGraw-Hill Publishing Company, 2003.
3. Hector Garcia–Molina, Jeffrey D.Ullman and Jennifer Widom- "Database System Implementation"- Pearson Education- 2000.
4. Peter Rob and Corlos Coronel- "Database System, Design, Implementation and Management", Thompson Learning Course Technology- Fifth edition, 2

17150H24P - 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.

17150H25P - 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^{th} edition, 2001.

REFERENCES:

1. Ian Sommerville, Software engineering, Pearson education Asia, 6^{th} edition, 2000.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F Peters and Witold Pedryez, "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.

17148S31P - 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 – Contra positive – 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 – Sub semigroups and Submonoids - Cosets and Lagrange's theorem – Codes and group codes – Basic notions of error correction - Error recovery in group codes.

TOTAL :60hrs

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.

50H32P - OPERATING SYSTEM ***CSE/Sem III***

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

UNIT V *9*

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, 4th Edition, 2003.
4. Pramod Chandra P. Bhatt – "An Introduction to Operating Systems, Concepts and Practice", PHI, 2003.

17150H33P - 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.

RE`FERENCES:

1. Nils J. Nilsson, “Artificial Intelligence: A new Synthesis”, Harcourt Asia Pvt. Ltd., 2000.
2. Elaine Rich and Kevin Knight, “Artificial Intelligence”, 2nd Edition, Tata McGraw-Hill, 2003.

17150H34P - 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.

17150L35P -OPERATING SYSTEMS AND NETWORKING LAB

LIST OF EXERCISE:

OPERATING SYSTEMS:

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
   - command syntax
   - write simple functions
   - basic tests

2. Shell programming
   - loops
   - patterns
   - expansions
   - substitutions

3. Write programs using the following system calls of UNIX operating system: fork, exec, getpid, exit, wait, close, stat, opendir, readdir

4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)

5. Write C programs to simulate UNIX commands like ls, grep, etc.

6. Implement some memory management schemes

NETWORKING:

1. Simulation of ARP / RARP.

2. Write a program that takes a binary file as input and performs bit stuffing and CRC Computation.

3. Simulation of Sliding-Window protocol.

4. Develop a Client – Server application for chat.

5. Develop a Client that contacts a given DNS Server to resolve a given host name.

6. Write a Client to download a file from a HTTP Server.

17150H41P - 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.

17150H42P - 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.

17150H43P -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 : 60 hrs

TEXT BOOKS:

1. E. Balagurusamy, “Programming in C#”, Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, “Programming C#”, 2nd ed., O’Reilly, 2002. (Unit III, IV, V)

REFERENCES:

1. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw-Hill, 2004.
2. Robinson et al, “Professional C#”, 2^{nd} 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.

17150L45P - INTERNET PROGRAMMING LAB

1. Write programs in Java to demonstrate the use of following components Text fields, buttons, Scrollbar, Choice, List and Check box
2. Write Java programs to demonstrate the use of various Layouts like Flow Layout, Border Layout, Grid layout, Grid bag layout and card layout
3. Write programs in Java to create applets incorporating the following features:
4. Create a color palette with matrix of buttons
   i) Set background and foreground of the control text area by selecting a color from color palette.
   ii) In order to select Foreground or background use check box control as radio buttons
   iii) To set background images
5. Write programs in Java to do the following.
   i) Set the URL of another server.
   ii) Download the homepage of the server.
   iii) Display the contents of home page with date, content type, and Expiration date. Last modified and length of the home page.
6. Write programs in Java using sockets to implement the following:
   i) HTTP request
   ii) FTP
   iii) SMTP
   iv) POP3
7. Write a program in Java for creating simple chat application with datagram sockets and datagram packets.
8. Create a web page with the following using HTML
   i) To embed a map in a web page
   ii) To fix the hot spots in that map
   iii) Show all the related information when the hot spots are clicked.
9. Create a web page with the following.
   i) Cascading style sheets.
   ii) Embedded style sheets.
   iii) Inline style sheets.
   iv) Use our college information for the web pages.

17150H51P - 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.

17150H52P - 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. Norman E. Fenton and Shari Lawrence Pfleeger, “Software Metrics” Thomson, 2003
2. Mordechai Ben – Menachem and Garry S.Marliss, “Software Quality”, Thomson Asia Pte Ltd, 2003.
3. Mary Beth Chrissis, Mike Konrad and Sandy Shrum, “CMMI”, Pearson Education (Singapore) Pte Ltd, 2003.
4. ISO 9000-3 “Notes for the application of the ISO 9001 Standard to software development”.

17150H53P - GRAPHICS AND MULTIMEDIA

AIM:

Provide an opportunity for students to represent, design and implement two dimensional and three dimensional objects and introducing different media used in multimedia systems.

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OBJECTIVES:

- Explain two and three dimensional concepts and their applications.
- Identify all techniques related to modern graphics programming concepts.
- Identify the media used in multimedia systems and to assess their relative advantages and disadvantages relative to both user and system points of view.
- Explain the interaction problems introduced by multimedia (e.g., compression and synchronization).

UNIT I OUTPUT PRIMITIVES 9+3

Introduction -Line -Curve and Ellipse Drawing Algorithms – Attributes – Two-Dimensional Geometric Transformations – Two-Dimensional Clipping and Viewing.

UNIT II THREE-DIMENSIONAL CONCEPTS 9+3

Three-Dimensional Object Representations – Three-Dimensional Geometric and Modeling Transformations – Three-Dimensional Viewing – Color models – Animation.

UNIT III MULTIMEDIA SYSTEMS DESIGN 9+3

An Introduction – Multimedia applications – Multimedia System Architecture – Evolving technologies for Multimedia – Defining objects for Multimedia systems – Multimedia Data interface standards – Multimedia Databases.

UNIT IV MULTIMEDIA FILE HANDLING 9+3

Compression & Decompression – Data & File Format standards – Multimedia I/O technologies - Digital voice and audio – Video image and animation – Full motion video – Storage and retrieval Technologies.

UNIT V HYPERMEDIA 9+3

Multimedia Authoring & User Interface – Hypermedia messaging - Mobile Messaging – Hypermedia message component – Creating Hypermedia message – Integrated multimedia message standards – Integrated Document management – Distributed Multimedia Systems.

TOTAL : 60hrs

TEXT BOOKS:

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)

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.

17150L55P - SOFTWARE DEVELOPMENT LAB

IMPLEMENTATION OF PROJECT USING SOFTWARE ENGINEERING TECHNIQUES:

1. PROJECT PLANNING
2. SOFTWARE REQUIREMENT ANALYSIS
3. DATA MODELLING & IMPLEMENTATION
4. SOFTWARE TESTING
5. SOFTWARE DEBUGGING

LIST OF EXPERIMENTS

Develop the following software using software Engineering methodology:

1. Online Railway reservation system
2. Simulator software for parallel processing operation
3. Payroll processing application
4. Inventory system
5. Simulator software for compiler operation
6. Automating the Banking process
7. Software for game
8. Library management system
9. Text editor
10. Create a dictionary
11. Telephone directory
12. Create an E- Book of your choice.

17150S61P - 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.
2. Michael J. Pont, “Embedded C”, Pearson Education , 2007.

REFERENCES:

1. Steve Heath, “Embedded System Design”, Elsevier, 2005.
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi and Rolin D. McKinlay, “The 8051 Microcontroller and Embedded Systems”, Pearson Education, Second edition, 2007.

17150H62P - ADVANCED JAVA PROGRAMMING

AIM:

To explore, advanced Java language features and packages.

OBJECTIVES:

- Use Java to implement OOAD.
- to have in depth knowledge about Object serialization, reflection,RMI,Swing,JAR files .
- an ability to Write Servlets and Java Server Pages .
- Gain an in-depth understanding of database programming in Java using JDBC.
- Learn Java's security model and how to do security programming in Java.

UNIT I JAVA FUNDAMENTALS 9+3

Java I/O streaming – filter and pipe streams – Byte Code interpretation - reflection – Dynamic Reflexive Classes – Threading – Java Native Interfaces- Swing.

UNIT II NETWORK PROGRAMMING IN JAVA 9+3

Sockets – secure sockets – custom sockets – UDP datagrams – multicast sockets – URL classes – Reading Data from the server – writing data – configuring the connection – Reading the header – telnet application – Java Messaging services

UNIT III APPLICATIONS IN DISTRIBUTED ENVIRONMENT 9+3

Remote method Invocation – activation models – RMI custom sockets – Object Serialization – RMI – IIOP implementation – CORBA – IDL technology – Naming Services – CORBA programming Models - JAR file creation

UNIT IV MULTI-TIER APPLICATION DEVELOPMENT 9+3

Server side programming – servlets – Java Server Pages - Applet to Applet communication – applet to Servlet communication - JDBC – Using BLOB and CLOB objects – storing Multimedia data into databases – Multimedia streaming applications – Java Media Framework.

UNIT V ENTERPRISE APPLICATIONS 9+3

Server Side Component Architecture – Introduction to J2EE – Session Beans – Entity Beans – Persistent Entity Beans – Transactions.

TOTAL : 60 hrs

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. Hortsmann & 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.

17150H63P - 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 – Status Meetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types of reviews – Developing a review program – Components of Review Plans– Reporting Review Results. – evaluating software quality – defect prevention – testing maturity model

TOTAL: 45hrs

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.

17150L65P - JAVA PROGRAMMING LAB

LIST OF PRACTICALS

AIM:

To learn and Practice the basics of JAVA language

OBJECTIVES:

1. To learn & practice the Object Oriented concepts like Inheritance, Overloading etc.
2. To learn & practice Interfaces and Packages
3. To learn &practice Java applet programming

JAVA BASICS

1. Programs illustrating various data types in Java
2. Programs illustrating class, objects and methods
3. Programs for addition and multiplication of Matrices
4. Programs illustrating Overloading in Java
5. Programs illustrating the implementation of Various forms of Inheritance(Single, Hierarchical, Multilevel)
6. Programs illustrating Overriding methods in Java
7. Programs illustrating Exception Handling
8. Programs to manipulate strings

JAVA INTERFACES, PACKAGES and THREADS

9. Programs illustrating Interfaces in Java
10. Programs to create Packages in Java
11. Programs illustrating Threads in Java

JAVA APPLETS

12. Programs to write applets to draw the various shapes
13. Programs to manipulate labels, lists, text fields and panels

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 − PDSA Cycle − 5S −Kaizen − Supplier Partnership – Partnering − Sourcing − Supplier Selection −Supplier Rating − Relationship Development − Performance Measures − BasicConcepts − Strategy − Performance Measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

The Seven Tools of Quality − Statistical Fundamentals − Measures of Central Tendency and dispersion − Population and Sample − Normal Curve − Control Charts for Variables and Attributes − Process Capability − Concept of Six Sigma − New Seven Management Tools.

Benchmarking − Reasons to Benchmark − Benchmarking Process − Quality Function Deployment (QFD) − House of Quality − QFD Process − Benefits − Taguchi Quality Loss Function − Total Productive Maintenance (TPM) − Concept − Improvement Needs − FMEA − Stages of FMEA.

UNIT V *QUALITY SYSTEMS* *9*

Need for ISO 9000 and Other Quality Systems − ISO 9000:2000 Quality System – Elements − Implementation of Quality System−Documentation−Quality Auditing−TS 16949−ISO 14000 – Concept−Requirements and Benefits.

Total: 45hrs

TEXT BOOK:

1. Besterfiled 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.

150H72P - GRID COMPUTING ***CSE/Sem VII***

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.

UNIT I GRID COMPUTING 9

Introduction - Definition and Scope of grid computing

UNIT II GRID COMPUTING INITIALIVES 9

Grid Computing Organizations and their roles – Grid Computing analog – Grid Computing road map.

UNIT III GRID COMPUTING APPLICATIONS 9

Merging the Grid sources – Architecture with the Web Devices Architecture.

UNIT IV TECHNOLOGIES 9

OGSA – Sample use cases – OGSA platform components – OGSI – OGSA Basic Services.

UNIT V GRID COMPUTING TOOL KITS 9

Globus GT 3 Toolkit – Architecture, Programming model, High level services – OGSI .Net middleware Solutions.

TOTAL : 45 hrs

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.

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)

17150E44AP - 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

OBJECTIVES:

- To focus on the study of abstract models of computation.
- To assess via formal reasoning what could be achieved through computing when they are using it to solve problems in science and engineering.
- To introduce fundamental questions about problems, such as whether they can or not be computed, and if they can, how efficiently.

UNIT I AUTOMATA 9+3

Introduction to formal proof – Additional forms of proof – Inductive proofs –Finite Automata (FA) – Deterministic Finite Automata (DFA)– Non-deterministic Finite Automata (NFA) – Finite Automata with Epsilon transitions.

UNIT II REGULAR EXPRESSIONS AND LANGUAGES 9+3

Regular Expression – FA and Regular Expressions – Proving languages not to be regular – Closure properties of regular languages – Equivalence and minimization of Automata.

UNIT III CONTEXT-FREE GRAMMAR AND LANGUAGES 9+3

Context-Free Grammar (CFG) – Parse Trees – Ambiguity in grammars and languages – Definition of the Pushdown automata – Languages of a Pushdown Automata – Equivalence of Pushdown automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT-FREE LANGUAGES 9+3

Normal forms for CFG – Pumping Lemma for CFL - Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V UNDECIDABILITY 9+3

A language that is not Recursively Enumerable (RE) – An undecidable problem that is RE – Un decidable problems about Turing Machine – Post's Correspondence Problem - The classes P and NP.

TOTAL : 60hrs

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, Pearson Education/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.

17150E44BP - 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. Task Classes, Performance Measures for Real Time Systems, Estimating Program Run times. Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms, UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and Fault Tolerant 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 Level programming, 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, Main Memory Databases, Transaction priorities, Transaction Aborts, Concurrency Control Issues, 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. Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling.

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.

17150E44CP -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 Menus – 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– Accesssibility– Icons– Image– Multimedia – Coloring.

UNIT V WINDOWS LAYOUT– TEST *9+3*

Prototypes – Kinds Of Tests – Retest – Information Search – Visualization – Hypermedia –

WWW– Software Tools.

TOTAL: 60 hrs

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

17150E44DP - ADVANCED DATABASES

AIM:

To have strong knowledge on Database Management Systems, Database technologies , an application-oriented , system-oriented approach towards database design.

OBJECTIVES:

- Be able to design high-quality relational databases and database applications.
- Have developed skills in advanced visual & conceptual modeling and database design.
- Be able to translate complex conceptual data models into logical and physical database designs.
- Have developed an appreciation of emerging database trends as they apply to semi-structured data, the internet, and object-oriented databases.

UNIT I DISTRIBUTED DATABASES 9+3

Distributed DBMS Concepts and Design – Introduction – Functions and Architecture of DDBMS – Distributed Relational Database Design – Transparency in DDBMS – Distributed Transaction Management – Concurrency control – Deadlock Management – Database recovery – The X/Open Distributed Transaction Processing Model – Replication servers – Distributed Query Optimisation - Distribution and Replication in Oracle.

UNIT II OBJECT ORIENTED DATABASES 9+3

Object Oriented Databases – Introduction – Weakness of RDBMS – Object Oriented Concepts Storing Objects in Relational Databases – Next Generation Database Systems – Object Oriented Data models – OODBMS Perspectives – Persistence – Issues in OODBMS – Object Oriented Database Management System Manifesto – Advantages and Disadvantages of OODBMS – Object Oriented Database Design – OODBMS Standards and Systems – Object Management Group – Object Database Standard ODMG – Object Relational DBMS –Postgres - Comparison of ORDBMS and OODBMS.

UNIT III WEB DATABASES 9+3

Web Technology And DBMS – Introduction – The Web – The Web as a Database Application Platform – Scripting languages – Common Gateway Interface – HTTP Cookies – Extending the Web Server – Java – Microsoft's Web Solution Platform – Oracle Internet Platform – Semi structured Data and XML – XML Related Technologies – XML Query Languages

UNIT IV INTELLIGENT DATABASES 9+3

Enhanced Data Models For Advanced Applications – Active Database Concepts And Triggers – Temporal Database Concepts – Deductive databases – Knowledge Databases.

UNIT V CURRENT TRENDS 9+3

Mobile Database – Geographic Information Systems – Genome Data Management – Multimedia Database – Parallel Database – Spatial Databases - Database administration – Data Warehousing and Data Mining.

TOTAL : 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, Pearso nEducation, 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, 5th Edition, 2003.

SEMESTER - V (ELECTIVE II)

17150E54AP - 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: Prepositional and Predicate Calculus Rule Based knowledge Representation Symbolic Reasoning Under Uncertainity 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: 60 hrs

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.

17150E54BP - 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 complier.
- 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.

TOTAL : 60hrs

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. Louden, "Compiler Construction: Principles and Practice", Thompson Learning, 2003

17150E54CP - 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.

17150E54DP - 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 WIRLESS 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 Wesolowshi, "Mobile Communication Systems", John Wiley and Sons Ltd, 2002.

SEMESTER –VI
(ELECTIVE III)

17160E64AP –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.

17150E64BP - 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-Operating System Services- Assumptions About Hardware. Introduction to the Kernel-Architecture System Concepts-Data Structures- System Administration.

UNIT II *9*

The Buffer Cache-Headers-Buffer Pool-Buffer Retrieval-Reading and Writing Disk Blocks-Advantages and Disadvantages. Internal Representation of Files-Inodes- Structure-Directories-Path Name to Inode- Super Block-Inode Assignment-Allocation of Disk Blocks -Other File Types.

UNIT III *9*

System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special files Creation-Change Directory and Change Root-Change Owner and Change Mode- Stat- Fstat-Pipes-Dup-Mount-Unmount-Link-Unlink-File System Abstraction- Maintenance.

UNIT IV *9*

The System Representation of Processes-States-Transitions-System Memory-Context of a Process-Saving the Context-Manipulation of a Process Address Space-Sleep Process Control-signals-Process Termination-Awaiting-Invoking other Programs-The Shell-System Boot and the INIT Process.

UNIT V *9*

Memory Management Policies-Swapping-Demand Paging-a Hybrid System- I/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

17150E64CP - 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 II ENABLING 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.

17150E64DP –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: 45 hrs**

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) 17150E73AP - 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

17150E73BP - 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 – protein structure – 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.

17150E73CP - 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 over the Life Cycle - Test Artifacts - Management Artifacts - Engineering Artifacts - Pragmatic Artifacts. Model-Based Software Architectures - Management Perspective - Technical Perspective. Workflows of the Process - Software Process Workflows - Iteration Workflows - Checkpoints of the Process.

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-Business Organizations - Project Organizations - Evolution of Organizations. Process Automation - Tools: Automation Building Blocks - Project Environment - Round-Trip Engineering - Change Management. Project Control and Process Instrumentation - Seven Core Metrics - Management Indicators - Quality Indicators - . Pragmatic Software Metrics - Metrics Automation.

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 – Project Tracking - Activities Tracking - Defect Tracking - Issues Tracking - Status Reports - Milestone Analysis. Defect Analysis 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

17150E73DP -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.

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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 | *HOD*

ENGINEERING AND TECHNOLOGY | **DEPT.OF CSE**

COURSE STRUCTURE

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
Practical						
I	19250L17	Advanced Web Technologies Lab	0	0	3	3
Research Skill Development(RSD) Courses						
I	**19250CRS**	**Research Led Seminar**	**0**	**0**	**0**	**1**
Total no of Credit					**27**	

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
Practical						
II	19250L26	.NET Technologies Lab	0	0	3	3
II	192TECWR	Technical Writing /Seminars	0	0	3	3
Research Skill Development(RSD) Courses						
II	**19250CRM**	**Research Methodology**	**3**	**0**	**0**	**3**
II	**19250CBR**	**Participation in Bounded Research**	**2**	**0**	**0**	**2**
Total no of Credit					**29**	

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
Research Skill Development(RSD) Courses						
III	**19250CSR**	Design/Socio Technical Project	**0**	**0**	**0**	**6**
Total no of Credit					**29**	

SEMESTER - IV

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	19250P41	Project Work- Phase II	-	-	15	15
Total no of Credit					**15**	

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
Total Credits											**100**

*RSD-Research Skill Development

TOTAL CREDITS	
Semester – I	**27**
Semester – II	**29**
Semester – III	**29**
Semester – IV	**15**
TOTAL	**100**

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

17248S11A - 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= (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.

17250H12 - 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 , 3rd 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.

CSE/Semester - I

17250H13 - PARALLEL AND HIGH PERFORMANCE COMPUTING

L T P C

4 0 0 4

AIM:

12

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, 2nd 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", byKai

Hwang, McGraw Hill1993.

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)

CSE/Semester – I

17250H14 -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.

CSE/Semester - I

17250H15 - 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 toRandomized Algorithms.

Total :60 hrs

REFERENCES

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures inC++, Uiversity 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

17250L17 -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.

CSE/Semester - II

17250H21 - 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.

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 effectivesoftware 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 – ObjectOriented 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 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.

17250H23 - DIGITAL IMAGE PROCESSING

L T P C

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.

UNITI DIGITAL IMAGE FUNDAMENTALS 9

Image formation, Image transforms – fourier transforms, Walsh, Hadamard, Discrete cosine, Hotelling transforms.

UNIT II IMAGE ENHANCEMENT & RESTORATION 9

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering.

UNIT III IMAGE COMPRESSION & SEGMENTATION 9

Compression Models - Elements of information theory - Error free Compression -Image segmentation –Detection of discontinuities - Edge linking and boundary detection - Thresholding – Region based segmentation - Morphology.

UNIT IV REPRESENTATION AND DESCRIPTION 9

Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors

UNIT V OBJECT RECOGNITION AND INTERPRETATION 9

Patterns and pattern classes - Decision-Theoretic methods - Structural methods.

Total:45 hrs

REFERENCES:

1. Gonzalez.R.C& Woods. R.E., Digital Image Processing, 2nd 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.

17250L26 - .NET TECHNOLOGIES LAB

L	T	P	C
0	0	3	3

30

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.

17250CRM - 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.

CSE/Semester - III

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 Gopalaswamy, "Managing Global Projects", Tata McGraw Hill, 2001.
2. Bob Hughes, Mikecotterell, "Software Project Management", 3rd Edition, Tata cGraw Hill, 2004.

CSE/Elective –I/Semester - I

SEMESTER - I - ELECTIVE - I 17250E16A - 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.

CSE/Elective –I/Semester - I

17250E16B- 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 : Abrief 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*

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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 &otherreordering 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

REFERENCE BOOKS:

1. Melanle 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

CSE/Elective –I/Semester - I

17250E16C - 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

CSE/Elective –II/Semester - II

17250E24A - 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

17250E24B- 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.

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.

17250E24C- 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

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

17250E25A- 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.

CSE/Elective –III/Semester - II

17250E25B - HIGH SPEED NETWORKS

L T P C

AIM: 4 0 0 4

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

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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, RTCP.

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

17250E25C- 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 – IIRTOS.

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.

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.

17250E32A - 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**

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 AntonopoulosSpringer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

CSE/Elective –IV/Semester – III

17250E32B - 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" 2nd edition, Pearson Education

REFERENCE BOOK:

1. Mark Merkow, James Breithaupt, " Information Security: Principles and Practices", 1st edition, Pearson Education.
2. Whitman, "Principles of Information Security", 2nd edition, Pearson Education
3. William Stallings, " Cryptography an d Network Security: Principles and Practices", 3rd edition, Pearson Education.
4. Charles P Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 3rd edition

CSE/Elective –IV/Semester – III

17250E32C - 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:

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- 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*

60

Introduction to Neuro – Fuzzy and Soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set–Theoretic Operations – Member Function Formulation and Parameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and Fuzzy Relations – Fuzzy If Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT-II OPTIMIZATION *8*

Derivative based Optimization – Descent Methods – The Method of Steepest Descent – Classical Newton's Method – Step Size Determination – Derivative Free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT-III NEURAL NETWORKS *10*

Supervised Learning Neural Networks – Perceptrons – Adaline – Backpropagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

UNIT-IV NEURO FUZZY MODELING *9*

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – Learning Methods that Cross fertilize ANFIS and RBFN – Coactive Neuro Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT-V APPLICATION OF COMPUTATIONAL INTELLIGENCE *8*

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency Prediction – Soft Computing for Color Recipe Prediction.

Total: 45 hrs

TEXTBOOK:

1. J. S. R. Jang, C. T. 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.

CSE/Elective –V/Semester – III

17250E33A - 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 structure s 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.

17250E33B - 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*

66

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.

17250E33C - 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

17250E34A - 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. 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

17250E34B - BIO-INFORMATICS

L T P C

AIM:

4 0 0 4

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.

CSE/Elective –VI/Semester – III

17250E34C - WIRELESS APPLICATION PROTOCOLS

L T P C

74

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**
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 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.

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 *HOD*

ENGINEERING AND TECHNOLOGY **DEPT.OF CSE**

COURSE STRUCTURE

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
Practical						
I	19250L14P	Advanced Web Technologies Lab	-	-	3	3
Research Skill Development(RSD) Courses						
I	**19250HRSP**	**Research Led Seminar**	**1**	**0**	**0**	**1**
Total no of Credits					**16**	

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
Practical						
II	19250L24P	.NET Technologies Lab	-	-	3	3
II	192TECWRP	Technical Writing /Seminars	-	-	3	3
Research Skill Development(RSD) Courses						
II	**19250CRMP**	**Research Methodology**	**3**	**0**	**0**	**3**
II	**19250CBRP**	**Participation in Bounded Research**	**2**	**0**	**0**	**2**
Total no of Credits					**23**	

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
Research Skill Development(RSD) Courses						
III	**19250CSRP**	Design/Socio Technical Project	**0**	**0**	**4**	**4**
Total no of Credits					**16**	

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-V	4	0	0	4
IV	19250P44P	Project Work- Phase I	-	-	6	6
Total no of Credits					**18**	

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
Total no of Credits					**12**	

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**
Total Credits										**97**

*RSD-Research Skill Development

TOTAL CREDITS	
Semester – I	**16**
Semester – II	**23**
Semester – III	**16**
Semester – IV	**18**
Semester – V	**12**
Semester – VI	**12**
TOTAL	**97**

HOD *DEAN (E&T)* *DEAN ACADEMICS* *VICE CHANCELLOR*

17248S11AP - 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= (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

17248S11AP - HIGHER MATHEMATICS

L T P C
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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

17250H12P - 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 , 3rd 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.

17250H13P - PARALLEL AND HIGH PERFORMANCE COMPUTING

L	T	P	C
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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, 2nd 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", byKai Hwang, McGraw Hill1993.
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)

17250H14P -ADHOC AND SENSOR NETWORK

L T P C

AIM: 4 0 0 4

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.

17250H15 - 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 toRandomized Algorithms.

Total :60 hrs

REFERENCES

1. E. Horowitz, S.Sahni and Dinesh Mehta, Fundamentals of Data structures inC++, Uiversity 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.

17250L17 -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.

17250H21 - 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 effectivesoftware 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 – ObjectOriented 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 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.

17250H23 - DIGITAL IMAGE PROCESSING

L	**T**	**P**	**C**
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.

UNITI DIGITAL IMAGE FUNDAMENTALS 9

Image formation, Image transforms – fourier transforms, Walsh, Hadamard, Discrete cosine, Hotelling transforms.

UNIT II IMAGE ENHANCEMENT & RESTORATION 9

Histogram modification techniques - Image smoothening - Image Sharpening - Image Restoration - Degradation Model – Noise models - Spatial filtering – Frequency domain filtering.

UNIT III IMAGE COMPRESSION & SEGMENTATION 9

Compression Models - Elements of information theory - Error free Compression -Image segmentation –Detection of discontinuities - Edge linking and boundary detection - Thresholding – Region based segmentation - Morphology.

UNIT IV REPRESENTATION AND DESCRIPTION 9

Representation schemes- Boundary descriptors- Regional descriptors - Relational Descriptors

UNIT V OBJECT RECOGNITION AND INTERPRETATION 9

Patterns and pattern classes - Decision-Theoretic methods - Structural methods.

Total:45 hrs

REFERENCES:

1. Gonzalez.R.C& Woods. R.E., Digital Image Processing, 2nd 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.

17250L26 - .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.

17250CRM - RESEARCH METHODOLOGY

L T P C

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:

- 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 Gopalaswamy, “Managing Global Projects”, Tata McGraw Hill, 2001.
2. Bob Hughes, Mikecotterell, “Software Project Management”, 3rd Edition, Tata cGraw Hill, 2004.

SEMESTER - I - ELECTIVE - I
17250E16A - MULTIMEDIA SYSTEMS

L T P C

AIM: 4 0 0 4

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.

17250E16B- 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 : Abrief 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 &otherreordering 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

REFERENCE BOOKS:

1. Melanle 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

17250E16C - 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

17250E24A - ADVANCED DISTRIBUTED COMPUTING

L T P C

AIM:

4 0 0 4

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

17250E24B- 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.

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.

17250E24C- ARTIFICIAL NEURAL NETWORKS

L T P C

AIM: 4 0 0 4

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

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

AIM:

17250E25A- SERVICE ORIENTED ARCHITECTURE

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.

17250E25B - HIGH SPEED NETWORKS

L T P C

AIM: 4 0 0 4

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, RTCP.

Total: 45 hrs

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

17250E25C- 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 – IIRTOS.

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.

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.

17250E32A - 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.

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

17250E32B - INFORMATION SECURITY

L T P C

AIM:

4 0 0 4

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" 2nd edition, Pearson Education

REFERENCE BOOK:

1. Mark Merkow, James Breithaupt, " Information Security: Principles and Practices", 1st edition, Pearson Education.
2. Whitman, "Principles of Information Security", 2nd edition, Pearson Education
3. William Stallings, " Cryptography an d Network Security: Principles and Practices", 3rd edition, Pearson Education.
4. Charles P Pfleeger and Shari Lawrence Pfleeger, "Security in Computing", 3rd edition

17250E32C - 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:

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- 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.

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.

17250E33A - 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 structure s and standards of object relational databases.
Get familiar with the concepts of XML, Mobile and Multimedia Databases.

UNIT-I PARALLEL AND DISTRIBUTED DATABASES 9

Database System Architectures: Centralized and Client-Server Architectures – Server System Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/O Parallelism – Inter and Intra Query Parallelism – Inter and Intra operation Parallelism – Distributed Database Concepts - Distributed Data Storage – Distributed Transactions – Commit Protocols – Concurrency Control – Distributed Query Processing – Three Tier Client Server Architecture- Case Studies.

UNIT-II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – Type Constructors – Encapsulation of Operations – Methods – Persistence – Type and Class Hierarchies – Inheritance – Complex Objects – Object Database Standards, Languages and Design: ODMG Model – ODL – OQL – Object Relational and Extended – Relational Systems : Object Relational features in SQL/Oracle – Case Studies.

UNIT-III XML DATABASES 9

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – Web Databases – JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT-IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on Data Management - Location Dependent Data Distribution - Mobile Transaction Models - Concurrency Control - Transaction Commit Protocols- Mobile Database Recovery Schemes.

UNIT-V MULTIMEDIA DATABASES 9

Multidimensional Data Structures – Image Databases – Text/Document Databases- Video Databases – Audio Databases – Multimedia Database Design.

REFERENCES:

1. R. Elmasri, S.B. Navathe, "Fundamentals of Database Systems", Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approach to Design, Implementation and Management", Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database System Concepts", Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.

17250E33B - 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

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.

17250E33C - GREEN COMPUTING

L T P C

AIM: 4 0 0 4

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.

17250E34A - 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. 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.

17250E34B - 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.

17250E34C - 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**
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 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 AND ENGINEERING

Mapping of Courses to Crosscutting Issues

2020R

Programme Name &Code	Course Code	Course Title	Gender Sensitization	Professional Ethics	Environment and Sustainability	Human Values
B.Tech - 20UGCSEFT	20149L18	Physics and Chemistry Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	201VEA19	Value Education Engineering	–	–	–	–
B.Tech - 20UGCSEFT	20147S21	Technical English	–	–	–	–
B.Tech - 20UGCSEFT	20148S22	Engineering Mathematics–II	–	–	–	–
B.Tech - 20UGCSEFT	20149S23A	Physics for Information Science	–	–	–	–
B.Tech - 20UGCSEFT	20149S24A	Environmental Science And Engineering	–	–	✓	–

B.Tech - 20UGCSEFT	20153S25A	Basic Electrical, Electronics And Measurement Engineering	–	–	–	–
B.Tech - 20UGCSEFT	20150S26A	Programming in C	–	–	–	–
B.Tech - 20UGCSEFT	20154L27	Engineering Practices Lab	–	–	–	–
B.Tech - 20UGCSEFT	20150L28A	C Programming Lab	–	–	–	–
B.Tech - 20UGCSEFT	201ICA29	Fundamentals of Indian constitution and Economy	–	–	–	–
B.Tech - 20UGCSEFT	20148S31	Discrete Mathematics	–	–	–	–
B.Tech - 20UGCSEFT	20150S32	Digital Principles and System Design	–	–	–	–
B.Tech - 20UGCSEFT	20150C33	Data Structures	–	–	–	–
B.Tech - 20UGCSEFT	20150C34	Object Oriented Programming	–	–	–	–
B.Tech - 20UGCSEFT	20150S35	Communication Engineering	–	–	–	–
B.Tech - 20UGCSEFT	20150L36	Data Structures Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L37	Object Oriented Programming Laboratory	–	–	–	–

B.Tech - 20UGCSEFT	20150L38	Digital Systems Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L39	Interpersonal Skills/Listening &Speaking	–	–	–	–
B.Tech - 20UGCSEFT	20148S41A	Probability and Queuing Theory	–	–	–	–
B.Tech - 20UGCSEFT	20150C42	Computer Architecture	–	–	–	–
B.Tech - 20UGCSEFT	20150C43	Database Management Systems	–	–	–	–
B.Tech - 20UGCSEFT	20150C44	Design and Analysis of Algorithms	–	–	–	–
B.Tech - 20UGCSEFT	20150C45	Operating Systems	–	–	–	–
B.Tech - 20UGCSEFT	20150C46	Software Engineering	–	–	–	–
B.Tech - 20UGCSEFT	20150L47	Database Management Systems Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L48	Operating Systems Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L49	Advanced Reading and Writing	–	–	–	–
B.Tech - 20UGCSEFT	19150CRS	Research Led Seminar	–	–	–	–
B.Tech - 20UGCSEFT	20148S51A	Algebra and Number Theory	–	–	–	–

B.Tech - 20UGCSEFT	20150C52	Computer Networks	_	_	_	_
B.Tech - 20UGCSEFT	20150C53	Microprocessors and Microcontrollers	_	_	_	_
B.Tech - 20UGCSEFT	201__OE54	Open Elective –I	_	_	_	_
B.Tech - 20UGCSEFT	20150C55	Theory of Computation	_	_	_	_
B.Tech - 20UGCSEFT	20150C56	Object Oriented Analysis and Design	_	_	_	_
B.Tech - 20UGCSEFT	20150L57	Microprocessors and Microcontrollers Laboratory	_	_	_	_
B.Tech - 20UGCSEFT	20150L58	Object Oriented Analysis and Design Laboratory	_	_	_	_
B.Tech - 20UGCSEFT	20150L59	Networks Laboratory	_	_	_	_
B.Tech - 20UGCSEFT	20150CRM	Research Methodology	_	_	_	_
B.Tech - 20UGCSEFT	20150C61	Internet Programming	_	_	_	_
B.Tech - 20UGCSEFT	20150C62	Artificial Intelligence	_	_	_	_
B.Tech - 20UGCSEFT	20150C63	Mobile Computing	_	_	_	_
B.Tech - 20UGCSEFT	20150C64	Compiler Design	_	_	_	_

B.Tech - 20UGCSEFT	20150C65	Distributed Systems	–	–	–	–
B.Tech - 20UGCSEFT	20150E66	Elective-I	–	–	–	–
B.Tech - 20UGCSEFT	20150L61	Internet Programming Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L62	Mobile Application Development Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L63	Mini Project	–	–	–	–
B.Tech - 20UGCSEFT	20150L64	Professional Communication	–	✓	–	–
B.Tech - 20UGCSEFT	20150CBR	Participation in Bounded Research	–	–	–	–
B.Tech - 20UGCSEFT	20150S71	Principles of Management	–	–	–	✓
B.Tech - 20UGCSEFT	20150C72	Cryptography and Network Security	–	–	–	–
B.Tech - 20UGCSEFT	20150C73	Cloud Computing	–	–	–	–
B.Tech - 20UGCSEFT	201__OE74_	Open Elective-II	–	–	–	–
B.Tech - 20UGCSEFT	20150E75	Elective–II	–	–	–	–

B.Tech - 20UGCSEFT	20150E76	Elective–III	–	–	–	–
B.Tech - 20UGCSEFT	20150L77	Cloud Computing Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150L78	Security Laboratory	–	–	–	–
B.Tech - 20UGCSEFT	20150CSR	Design / Socio-Technical Project	–	–	–	–
B.Tech - 20UGCSEFT	20150E81 ___	Elective–IV	–	–	–	–
B.Tech - 20UGCSEFT	20150E82 ___	Elective–V	–	–	–	–
B.Tech - 20UGCSEFT	20150P83	Project Work	–	–	–	–
B.Tech - 20UGCSEFT	20150PEE	Program Exit Examination	–	–	–	–
B.Tech - 20UGCSEFT	20150E66A	Artificial Intelligence	–	–	–	–
B.Tech - 20UGCSEFT	20150E66B	Software Testing	–	–	–	–
B.Tech - 20UGCSEFT	20150E66C	Digital Image Processing	–	–	–	–
B.Tech - 20UGCSEFT	20150E66D	System Software	–	–	–	–

B.Tech - 20UGCSEFT	20150E66E	System Modelling & Simulation	–	–	–	–
B.Tech - 20UGCSEFT	20150E75A	Network Tools & Techniques	–	–	–	–
B.Tech - 20UGCSEFT	20150E75B	Python Programming with Web Frameworks	–	–	–	–
B.Tech - 20UGCSEFT	20150E75C	Software Project Management	–	–	–	✓
B.Tech - 20UGCSEFT	20150E75D	Linux Programming	–	–	–	–
B.Tech - 20UGCSEFT	20150E75E	System Software	–	–	–	–
B.Tech - 20UGCSEFT	20150E76A	Green Computing	–	–	–	–
B.Tech - 20UGCSEFT	20150E76B	Data Warehousing & Data Mining	–	–	–	–
B.Tech - 20UGCSEFT	20150E76C	C# and .Net Programming	–	–	–	–
B.Tech - 20UGCSEFT	20150E76D	Domain-centric Security	–	–	–	–
B.Tech - 20UGCSEFT	20150E76E	Network Administration& Management Tools	–	–	–	–
B.Tech - 20UGCSEFT	20150E81A	Digital Image Processing	–	–	–	–

B.Tech - 20UGCSEFT	20150E81B	Social Network Analysis	–	–	–	–
B.Tech - 20UGCSEFT	20150E81C	Information Security	–	–	–	–
B.Tech - 20UGCSEFT	20150E81D	Cyber Forensics	–	–	–	–
B.Tech - 20UGCSEFT	20150E81E	Soft Computing	–	–	–	–
B.Tech - 20UGCSEFT	20150E82A	Information Retrieval Techniques	–	–	–	–
B.Tech - 20UGCSEFT	20150E82B	Natural Language Processing	–	–	–	–
B.Tech - 20UGCSEFT	21149S13	Engineering Physics	–	–	–	–
B.Tech - 20UGCSEFT	21149S14	Engineering Chemistry	–	–	–	–
B.Tech - 20UGCSEFT	21150S15	Problem Solving And Python Programming	–	–	–	–

1.3.1 SUPPORTING DOCUMENTS

Courses which address the Gender Sensitization,HumanValues, Professional Ethics, Environment and sustainability.

SCHOOLOF ENGINEERINGAND TECHNOLOGY

DEPARTMENT OF CIVIL ENGINEERING

PROGRAM HAND BOOK

Gender Sensitization and Human Values	
Professional Ethics	..
HumanValues	
Environment and sustainability	
Professional Ethics & HumanValues	

COURSE STRUCTURE

B.TECH FT CIVIL R2020

I - VIII SEMESTERS CURRICULUM AND SYLLABI

B.TECH (FT) CIVIL [REGULATION 2020]

SEMESTER I

Sl.No	Course Code	CourseTitle	Periods PerWeek			Credit
	THEORY		L	T	P	
1	20147S11	Communicative English	4	0	0	4
2	20148S12	Engineering Mathematics–I	3	2	0	4
3	20149S13	Engineering Physics	3	0	0	3
4	20149S14	Engineering Chemistry	3	0	0	3
5	20154S15	Engineering Graphics	2	0	4	4
6	20150S16	Problem Solving and Python Programming	3	0	0	3
PRACTICALS						
7	20150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	20149L18	Physics and Chemistry Laboratory	0	0	3	2
9	201VEA19	Value Education				1
	TOTAL					26

SEMESTER II

SI.No	COURSECODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S21	Technical English(AllBranches)	4	0	0	4
2.	20148S22A	Engineering MathematicsII(AllBranches)	4	0	0	4
3.	20149S23D	Physics for Civil Engineering	3	0	0	3
4.	20149S24A	Environmental Science And Engineering	3	0	0	3
5.	20153S25E	Basic Electrical And Electronics Engineering	3	0	0	3
6.	20154S26D	Engineering Mechanics	3	2	0	4
PRACTICALS						
7.	20154L27	Engineering Practices Laboratory	0	0	3	2
8.	20155L28E	Computer Aided Building Drawing Lab	0	0	3	2
9.	201ICA29	Fundamentals of Indian Constitution and Economy	0	0	0	1
		TOTAL	**21**	**0**	**8**	**26**

SEMESTER III

S. No	Sub. Code	Nameof theSubject	L	T	P	C
THEORY						
1	20148S31C	Transforms and Partial Differential Equations	4	0	0	4
2	20155C2	Engineering Geology	3	2	0	4
3	20155C33	Construction Materials	4	0	0	4
4	20155C34	Strength of Materials-I	3	0	0	3
5	20155C35	Fluid Mechanics	3	2	0	4
6	20155C36	Surveying	4	0	0	3
PRACTICALS						
7	20155L37	Surveying Laboratory	0	0	3	2
8	20155L38	Construction Materials Laboratory	0	0	3	2
9	20155L39	Interpersonal Skills/Listening and Speaking	0	0	2	1
		TOTAL				27

SEMESTER IV

S.No	Sub.Code	Nameof theSubject	L	T	P	C
THEORY						
1	20148S41C	Numerical Methods	4	0	0	4
2	20155C42	Construction Techniques and Practices	3	2	0	4
3	20155C43	Strength of Materials II	4	0	0	4
4	20155C44	Applied Hydraulic Engineering	3	0	0	3
5	20155C45	ConcreteTechnology	3	2	0	4
6	20155C46	Soil Mechanics	3	0	0	3
PRACTICALS						
7	20155L47	Strength of Materials Lab	0	0	3	2
8	20155L48	Hydraulic Engineering Lab	0	0	3	2
9	20155L49	Advanced Reading &Writing	0	0	2	1
10	20155CRS	Research Led Seminar	0	0	2	1
TOTAL						28

SEMESTER–V

S. No	Sub. Code	Name of the Subject	L	T	P	C
		THEORY				
1	20155C51	Design of Reinforced Cement Concrete Elements	4	0	0	4
2	20155C52	Structural Analysis I	3	2	0	4
3	20155C53	Water Supply Engineering	3	0	0	3
4	20155FE54	Open Elective I	3	0	0	3
5	20155E55	Elective I	3	0	0	3
6	20155C56	Foundation Engineering	3	0	0	3
		PRACTICALS				
7	20155L57	Soil Mechanics Lab	0	0	3	2
8	20155L58	Water and Waste Water Analysis Lab	0	0	3	2
9	20155L59	Survey Camp	0	0	2	2
10	20155CRM	Research Methodology	0	0	2	3
11	201AGIE	Innovation and Entrepreneurship				2
	TOTAL					29

SEMESTER –VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
		THEORY				
1	20155C61	Design of Steel Structural Elements	3	0	0	3
2	20155C62	Structural Analysis II	3	2	0	4
3	20155C63	Irrigation Engineering	3	0	0	3
4	20155C64	Highway Engineering	3	0	0	3
5	20155C65	Waste Water Engineering	3	0	0	3
6	20155E66	Elective II	3	0	0	3
		PRACTICALS				
7	20155L67	Highway Engineering Laboratory	0	0	3	2
8	20155L68	Irrigation and Environmental Engineering Drawing	0	0	3	2
9	20147L69	Professional Communication	0	0	2	1
10	20155CBR	Participation in Bounded Research	0	0	2	1
11	201ASTT	Technical Training				2
	TOTAL					25

SEMESTER–VII

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	20155C71	Estimation , Costing & Valuation Engineering	4	0	0	4
2	20155C72	Railways, Airports, Docks And HarbourEngineering	3	2	0	4
3	20155C73	Structural Design and drawing	3	2	0	4
4	20155FE74	Open Elective II	4	0	0	3
5	20155E75	Elective III	4	0	0	3
PRACTICALS						
6	20155L76	Creative and Innovation project (activity based –subject related)	0	0	4	2
7	20155L77	Industrial Training (4 Weeks during VI th SemSummer)	0	0	0	2
8	20155L78	Technical Seminar	0	0	2	1
9	20155CSR	Design / Socio Technical Project	0	0	4	3
TOTAL						26

SEMESTER–VIII

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81	Elective IV	3	0	0	3
2	20155E82	Elective V	3	0	0	3
3	20155PW83	Project Work	0	0	30	10
4	20155PEE	Program Exit Exam				2
5	201AGPE	Professional Ethics and Human Values				2
6	201ASIM	Interview Skills Training and Mock Test				2
TOTAL						18

LIST OF ELECTIVES

SEMESTER – V

ELECTIVE I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E55A	Construction Equipment and Automation	3	0	0	3
2	20155E55B	Principles of Architecture	3	0	0	3
3	20155E55C	Geographic Information System	3	0	0	3
4	20155E55D	Forensic Engineering & Rehabilitation	3	0	0	3
5	20155E55E	Energy Efficient Buildings	3	0	0	3

SEMESTER – VI

ELECTIVE II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E66A	Energy and Environment	3	0	0	3
2	20155E66B	Environmental Policies and Legislation	3	0	0	3
3	20155E66C	Sustainable Urban Development Concepts and Strategies	3	0	0	3
4	20155E66D	Instrumental Methods and Analysis of Environmental Pollutants	3	0	0	3
5	20155E66E	Air pollution and control Engineering	3	0	0	3

SEMESTER – VI

ELECTIVE III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E75A	Building Automation & Management System	3	0	0	3
2	20155E75B	Design of Prestressed concrete structures	3	0	0	3
3	20155E75C	Pavement Design	3	0	0	3
4	20155E75D	Town Planning	3	0	0	3
5	20155E75E	Smart materials and smart structures	3	0	0	3

SEMESTER – VIII
ELECTIVE IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	20155E81A	Environmental Economics	3	0	0	3
2	20155E81B	Simulation and Modeling in Environmental Systems	3	0	0	3
3	20155E81C	Membrane Separation for Water and Waste water	3	0	0	3
4	20155E81D	Theory and Practice of Industrial Wastewater Treatment	3	0	0	3
5	20155E81E	Geo-environmental Engineering	3	0	0	3

ELECTIVE V

S. No	Sub. Code	Nameof theSubject	L	T	P	C
1	20155E82A	Airport & Waterways Engineering	3	0	0	3
2	20155E82B	Surface Hydrology	3	0	0	3
3	20155E82C	Prefabricated structures	3	0	0	3
4	20155E82D	Contracts Management	3	0	0	3
5	20155E82E	Sustainable Construction methods	3	0	0	3

OPEN ELECTIVE-I

1	20150FE54A	Database Management Systems (CSE)	3	0	0	3
2	20150FE54B	Cloud Computing (CSE)	3	0	0	3
3	20152FE54A	Basic of Bio Medical Instrumentation (ECE)	3	0	0	3
4	20152FE54B	Sensor and Transducers (ECE)	3	0	0	3
5	20153FE54A	Industrial Nano Technology (EEE)	3	0	0	3
6	20153FE54A	Energy Conservation and Management (EEE)	3	0	0	3
7	20154FE54A	Renewable Energy Sources (MECH)	3	0	0	3
8	20154FE54B	Automotive Systems (MECH)	3	0	0	3

OPEN ELECTIVE-II

1	20150FE74A	Introduction to C Programming (CSE)	**3**	**0**	**0**	**3**
2	20150FE74B	Data Structures & Algorithms (CSE)	**3**	**0**	**0**	**3**
3	20152FE74A	Robotics (ECE)	**3**	**0**	**0**	**3**
4	20152FE74B	Electronic Devices (ECE)	**3**	**0**	**0**	**3**
5	20153FE74A	Basic Circuit Theory (EEE)	**3**	**0**	**0**	**3**
6	20153FE74B	Introduction to Renewable Energy Systems (EEE)	**3**	**0**	**0**	**3**
7	20154FE74A	Industrial Safety (MECH)	**3**	**0**	**0**	**3**
8	20154FE74B	Testing of Materials (MECH)	**3**	**0**	**0**	**3**

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School of Engineering & Technology

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

B.Tech – Civil Engineering FT (R-2020)

Programme Name &Code	Course Code	Title of the Course	Cross Cutting Issues							
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainability and Human Values	Human Values	Professional Ethics	Environment and Sustainability	Professional Ethics, Human Values and Environment and Sustainability	Gender Sensitization
B.Tech-20UGCVLFT	20147S11	Communicative English					✓			
B.Tech-20UGCVLFT	20148S12	Engineering Mathematics – I					✓			
B.Tech-20UGCVLFT	20149S13	Engineering Physics								
B.Tech-20UGCVLFT	20149S14	Engineering Chemistry								
B.Tech-20UGCVLFT	20154S15	Engineering Graphics								
B.Tech-20UGCVLFT	20150S16	Problem Solving and Python Programming								
B.Tech-20UGCVLFT	20147S21	Technical English (All Branches)					✓			
B.Tech-20UGCVLFT	20148S22A	Engineering Mathematics II (All					✓			

		Branche s)								
B.Tech-20UGCVLFT	20149S23D	Physics for Civil Engineering								
B.Tech-20UGCVLFT	20149S24A	Environmental Science And Engineering						✓		
B.Tech-20UGCVLFT	20153S25E	Basic Electrical And Electronics Engineering								
B.Tech-20UGCVLFT	20154S26D	Engineering Mechanics								
B.Tech-20UGCVLFT	20148S31C	Transforms and Partial Differential Equations					✓			
B.Tech-20UGCVLFT	20155C32	Engineering Geology								
B.Tech-20UGCVLFT	20155C33	Construction Materials								
B.Tech-20UGCVLFT	20155C34	Strength of Materials –I								
B.Tech-20UGCVLFT	20155C35	Fluid Mechanics								
B.Tech-20UGCVLFT	20155C36	Surveying								
B.Tech-20UGCVLFT	20148S41C	Numerical Methods					✓			
B.Tech-20UGCVLFT	20155C42	Construction Techniques and Practices								
B.Tech-20UGCVLFT	20155C43	Strength of Materials II								
B.Tech-20UGCVLFT	20155C44	Applied Hydraulic Engineering								
B.Tech-20UGCVLFT	20155C45	Concrete Technology								
B.Tech-20UGCVLFT	20155C46	Soil Mechanics								
B.Tech-20UGCVLFT	20155C51	Design of Reinforced								

		Cement Concrete Elements								
B.Tech-20UGCVLFT	20155C52	Structural Analysis I								
B.Tech-20UGCVLFT	20155C53	Water Supply Engineering						✓		
B.Tech-20UGCVLFT	20150FE54A	Database Management Systems (CSE)					✓			
B.Tech-20UGCVLFT	20150FE54B	Cloud Computing (CSE)								
B.Tech-20UGCVLFT	20152FE54A	Basic Of Bio Medical Instrumentation (ECE)								
B.Tech-20UGCVLFT	20152FE54B	Sensor and Transducers (ECE)								
B.Tech-20UGCVLFT	20153FE54A	Industrial Nano Technology (EEE)								
B.Tech-20UGCVLFT	20153FE54A	Energy Conservation and Management (EEE)					✓			
B.Tech-20UGCVLFT	20154FE54A	Renewable Energy Sources (MECH)								
B.Tech-20UGCVLFT	20154FE54B	Automotive Systems (MECH)								
B.Tech-20UGCVLFT	20155E55A	Construction Equipment and Automation								
B.Tech-20UGCVLFT	20155E55B	Principles of Architecture								
B.Tech-	20155E55C	Geographic								

20UGCVLFT		Information System								
B.Tech-20UGCVLFT	20155E55D	Forensic Engineering & Rehabilitation								
B.Tech-20UGCVLFT	20155E55E	Energy Efficient Buildings								
B.Tech-20UGCVLFT	20155C56	Foundation Engineering								
B.Tech-20UGCVLFT	20155C61	Design of Steel Structural Elements								
B.Tech-20UGCVLFT	20155C62	Structural Analysis II								
B.Tech-20UGCVLFT	20155C63	Irrigation Engineering						✓		
B.Tech-20UGCVLFT	20155C64	Highway Engineering								
B.Tech-20UGCVLFT	20155C65	Waste Water Engineering						✓		
B.Tech-20UGCVLFT	20155E66A	Energy and Environment						✓		
B.Tech-20UGCVLFT	20155E66B	Environmental Policies and Legislation						✓		
B.Tech-20UGCVLFT	20155E66C	Sustainable Urban Development Concepts and Strategies								
B.Tech-20UGCVLFT	20155E66D	Instrumental Methods and Analysis of Environmental Pollutants						✓		
B.Tech-20UGCVLFT	20155E66E	Air pollution and control Engineering								
B.Tech-20UGCVLFT	20155C71	Estimation , Costing & Valuation Engineering								
B.Tech-20UGCVLFT	20155C72	Railways, Airports, Docks								

		And Harbour Engineering								
B.Tech-20UGCVLFT	20155C73	Structural Design and drawing								
B.Tech-20UGCVLFT	20150FE74A	Introduction to C Programming (CSE)								
B.Tech-20UGCVLFT	20150FE74B	Data Structures & Algorithms (CSE)								
B.Tech-20UGCVLFT	20152FE74A	Robotics (ECE)								
B.Tech-20UGCVLFT	20152FE74B	Electronic Devices (ECE)								
B.Tech-20UGCVLFT	20153FE74A	Basic Circuit Theory (EEE)								
B.Tech-20UGCVLFT	20153FE74B	Introduction to Renewable Energy Systems (EEE)								
B.Tech-20UGCVLFT	20154FE74A	Industrial Safety (MECH)								
B.Tech-20UGCVLFT	20154FE74B	Testing of Materials (MECH)								
B.Tech-20UGCVLFT	20155E75A	Building Automation & Management System								
B.Tech-20UGCVLFT	20155E75B	Design of Prestressed concrete structures								
B.Tech-20UGCVLFT	20155E75C	Pavement Design								
B.Tech-20UGCVLFT	20155E75D	Town Planning								
B.Tech-20UGCVLFT	20155E75E	Smart materials and smart structures								
B.Tech-20UGCVLFT	20155E81A	Environmental Economics					✓		
B.Tech-20UGCVLFT	20155E81B	Simulation and Modeling in					✓		

		Environmental Systems								
B.Tech-20UGCVLFT	20155E81C	Membrane Separation for Water and Waste water								
B.Tech-20UGCVLFT	20155E81D	Theory and Practice of Industrial Wastewater Treatment						✓		
B.Tech-20UGCVLFT	20155E81E	Geo-environmental Engineering						✓		
B.Tech-20UGCVLFT	20155E82A	Airport & Waterways Engineering						✓		
B.Tech-20UGCVLFT	20155E82B	Surface Hydrology						✓		
B.Tech-20UGCVLFT	20155E82C	Prefabricated structures								
B.Tech-20UGCVLFT	20155E82D	Contracts Management					✓			
B.Tech-20UGCVLFT	20155E82E	Sustainable Construction methods								
B.Tech-20UGCVLFT	20155PW83	Project Work								
B.Tech-20UGCVLFT	201AGPE	Professional Ethics and Human Values		✓						
B.Tech-20UGCVLFT	201ASIM	Interview Skills Training and Mock Test								

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

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAM HANDBOOK

B.Tech – FULL TIME

[Regulation 2020]

COURSE STRUCTURE

B.E. MECHANICAL ENGINEERING

REGULATIONS – 2020

CHOICE BASED CREDIT SYSTEM

PROGRAMME EDUCATIONAL OBJECTIVES:

Bachelor of Mechanical Engineering curriculum is designed to impart Knowledge, Skill and Attitude on the graduates to

1. Have a successful career in Mechanical Engineering and allied industries.
2. Have expertise in the areas of Design, Thermal, Materials and Manufacturing.
3. Contribute towards technological development through academic research and industrial practices.
4. Practice their profession with good communication, leadership, ethics and social responsibility.
5. Graduates will adapt to evolving technologies through life-long learning.

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 industrial problems.

B. **Problem analysis**: Identify, formulates, and solve complex engineering problems. with high degree of competence.

C. **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.

D. **Design/development of solutions**: Design solutions for mechanical engineering problems and design components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

E. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering use modern tools, software and equipment to analyze multidisciplinary.

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	PROGRAMME OUTCOMES												
	A	B	C	D	E	F	G	H	I	J	K	L	M
1	3	3	2	3	2	1	1	2	1	1	3	1	3
2	3	3	3	3	3	1	1	1	1	1	1	2	2
3	3	3	3	3	3	3	2	3	1	2	2	2	2
4	3	3	2	3	3	2	3	2	1	2	2	2	2
5	3	3	3	3	3	3	3	2	2	2	2	2	2

1-Reasonable: 2- Significant: 3- Strong

*Gender Sensitization and Human Values
*Human Values
*Professional Ethics
*Environment and Sustainability
*Professional Ethics& Human Values

I - VIII SEMESTER CURRICULUM AND SYLLABI

B.TECH (FT) MECHANICAL [Regulation 2020]

SEMESTER I

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S11	Communicative English	4	0	0	4
2.	20148S12	Engineering Mathematics - I	4	0	0	4
3.	20149S13	Engineering Physics	3	0	0	3
4.	20149S14	Engineering Chemistry	3	0	0	3
5.	20154S15	Engineering Graphics	2	0	4	4
6.	20150S16	Problem Solving and Python Programming	3	0	0	3
PRACTICAL						
7.	20150L17	Problem Solving and Python Programming Laboratory	0	0	4	2
8.	20149L18	Physics and Chemistry Laboratory	0	0	4	2
9.	201AGIT	Induction Training Programme				2
TOTAL			**19**	**0**	**12**	**27**

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20147S21	Technical English (All Branches)	4	0	0	4
2.	20148S22	Engineering Mathematics II (All Branches)	4	0	0	4
3	20149S23C	Material Science (MECH)	3	0	0	3
4.	20149S24A	Environmental Science And Engineering (CSE, EEE, MECH, CIVIL)	3	0	0	3
5.	20153S25D	Basic Electrical, Electronics And Instrumentation Engineering (MECH)	3	0	0	3
6.	20154S26D	Engineering Mechanics (MECH,CIVIL)	3	2	0	4
PRACTICAL						
7.	20154L27	Engineering Practices Lab . (All Branches)	0	0	4	2
8.	20153L28D	Basic Electrical, Electronics and Instrumentation Engineering Lab (Mech)	0	0	4	2
9.	201AGIC	Indian Constitution				2
10	201ASBE	Basic Behavioral Etiquette				2
TOTAL			**20**	**2**	**8**	**29**

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148C31C	Transforms and Partial Differential Equations	4	0	0	4
2.	20154C32	Engineering Thermodynamics	3	2	0	4
3.	20154C33	Fluid Mechanics and Machinery	4	0	0	4
4.	20154C34	Production Technology - I	4	0	0	4
5.	20154C35	Electrical Drives and Controls	3	2	0	4
PRACTICAL						
6.	20154L36	Production Technology Laboratory - I	0	0	4	2
7.	20154L37	Computer Aided Machine Drawing	0	0	4	2
8.	20154L38	Electrical Engineering Laboratory	0	0	4	2
9.	20154L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
10	201AGGS	Introduction to Gender studies				2
TOTAL			**17**	**4**	**14**	**29**

SEMESTER IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20148C41D	Statistics and Numerical Methods	3	2	0	4
2.	20154C42	Theory of Machines-I	3	2	0	4
3.	20154C43	Production Technology – II	3	0	0	3
4.	20154C44	Engineering Metallurgy	3	0	0	3
5.	20154C45	Strength of Materials for Mechanical Engineers	3	2	0	4
6.	20154C46	Thermal Engineering- I	3	2	0	4
PRACTICAL						
7.	20154L47	Production Technology Laboratory - II	0	0	4	2
8.	20154L48	Strength of Materials and Fluid Mechanics and Machinery Laboratory	0	0	4	2
9.	20154L49	Advanced Reading and Writing	0	0	2	1
10	201AGCE	Community Engagement				2
11	201ASTT	Technical, General Aptitude and Skill set Development				2
TOTAL			**19**	**0**	**10**	**31**

SEMESTER V

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C51	Thermal Engineering- II	3	2	0	4
2.	20154C52	Design of Machine Elements	3	2	0	4
3.	20154C53	Metrology and Measurements	4	0	0	4
4.	2015-OE54-_	Open Elective I	3	0	0	3
5.	20154C55	Theory of Machines-II	3	2	0	4
PRACTICAL						
6.	20154L56	Theory of Machines Laboratory	0	0	4	2
7.	20154L57	Thermal Engineering Laboratory	0	0	4	2
8.	20154L58	Metrology and Measurements Laboratory	0	0	4	2
09	201AGIE	Innovation and Entrepreneurship				2
TOTAL			**16**	**6**	**12**	**27**

SEMESTER VI

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	20154C61	Design of Transmission Systems	3	2	0	4
2.	20154C62	Computer Aided Design And Manufacturing	3	2	0	4
3	20154C63	Heat and Mass Transfer	3	2	0	4
4	20154C64	Finite Element Analysis	3	2	0	4
5	20154C65	Hydraulics And Pneumatics	3	0	0	3
6	20154E66-_	Elective - I	3	0	0	3
PRACTICAL						
6	20154L67	CAD / CAM Laboratory	0	0	4	2
7	20154L68	Design and Fabrication Project	0	0	4	2
8	20154L69	Professional Communication	0	0	2	1
9	201ASTT	Technical Training				2
TOTAL			**18**	**8**	**10**	**29**

SEMESTER VII

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C71	Power Plant Engineering	4	0	0	4
2.	20154C72	Process Planning and Cost Estimation	3	2	0	4
3.	20154C73	Mechatronics	4	0	0	4
4.	2015-OE74__	Open ElectiveII	3	0	0	3
5.	20154E75-	Elective II	3	0	0	3
6.	20154E76-_	Elective III	3	0	0	3
PRACTICAL						
7.	20154L77	Simulation and Analysis Laboratory	0	0	4	2
8.	20154L78	Mechatronics Laboratory	0	0	4	2
9.	20154L79	Technical Seminar	0	0	2	1
TOTAL			**20**	**2**	**6**	**26**

SEMESTER VIII

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	20154C81	Principles of Management	3	0	0	3
2.	20154E82-_	Elective– IV	3	0	0	3
PRACTICAL						
3.	20154PW83	Project Work	0	0	20	15
4	201AGPE	Professional Ethics and Human Values				2
5	201ASIM	Interview Skills Training and Mock Test				2
.6	20154PEE	Programme Exit Examination				2
TOTAL			**6**	**0**	**20**	**27**

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ELECTIVE – I (VI SEMESTER)

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E66A	Automobile Engineering	3	0	0	3
2.	20154E66B	Safety in Engineering industries	3	0	0	3
3.	20154E66C	Gas Dynamics and Jet Propulsion	3	0	0	3
4.	20154E66D	Fundamentals of Nano Science	3	0	0	3

ELECTIVE – II (VII SEMESTER)

	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E75A	Renewable Sources of Energy	3	0	0	3
2.	20154E75B	Nonconventional Machining Processes	3	0	0	3
3.	20154E75C	Operations Research	3	0	0	3
4.	20154E75D	Total Quality Management	3	0	0	3

ELECTIVE – III (VII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E76A	Robotics	3	0	0	3
2.	20154E76B	Design of Jigs, Fixtures and Press Tools	3	0	0	3
3.	20154E76C	General Aspects of Energy Management and Energy audit	3	0	0	3
4.	20154E76D	Composite Materials	3	0	0	3

ELECTIVE – IV (VIII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	20154E82A	Production Planning and Control	3	0	0	3
2.	20154E82B	Computer Integrated Manufacturing Systems	3	0	0	3
3.	20154E82C	Energy Efficiency in Thermal Utilities	3	0	0	3
4.	20154E82D	Vibration and Noise Control	3	0	0	3

OPEN ELECTIVE– I

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	20150FE54A	Data Base management systems	3	0	0	3
2.		20150FE54B	Cloud computing	3	0	0	3
3.	ECE	20152FE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
4.		20152FE54B	Sensors And Transducers	3	0	0	3
5.	EEE	20153FE54A	Industrial Nano Technology	3	0	0	3
6.		20153FE54B	Energy Conservation and Management	3	0	0	3
7.	MECH	20154FE54A	Renewable energy sources	3	0	0	3
8.		20154OE54B	Automotive Systems	3	0	0	3
9.	CIVIL	20155FE54A	Air Pollution And Control Engineering	3	0	0	3
10.		20155FE54B	Geographic Information Systems	3	0	0	3

OPEN ELECTIVE– II

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1	CSE	20150FE74A	Introduction to C programming	3	0	0	3
2.		20150FE74B	Data structures and algorithms	3	0	0	3
3.	ECE	20152FE74A	Robotics	3	0	0	3
4.		20152FE74B	Electronic devices	3	0	0	3
5.	EEE	20153FE74A	Basic circuit theory	3	0	0	3
6.		20153FE74B	Introduction to renewable energy systems	3	0	0	3
7.	MECH	20154FE74A	Industrial safety	3	0	0	3
8.		20154FE74B	Testing of materials	3	0	0	3
9.	CIVIL	20155FE74A	Green building design	3	0	0	3
10.		20155FE74B	Waste water treatment	3	0	0	3

CGPA CREDITS

Semester	Core	Elective	Free elective	Practical	Seminar/ Exit exam	Audi	Project	Total
I	21	-	-	04	-	2	-	27
II	21	-	-	04	-	4	-	29
III	20	-	-	07	-	2	-	29
IV	22	-	-	05	-	4	-	31
V	16	-	03	06	-	2	-	27
VI	19	03	-	05	-	2	-	29
VII	12	06	03	04	1	-	-	26
VIII	03	03	-	-	2	4	15	27
TOTAL								225

NON-CGPA CREDITS

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

TOTAL CREDITS	
CGPA CREDITS	**225**
NON-CGPA CREDITS	**05**
TOTAL	**230**

20147S11	COMMUNICATIVE ENGLISH	L	T	P	C
		4	0	0	4

OBJECTIVES:

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

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

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

UNIT 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

20148S12 **ENGINEERING MATHEMATICS – I**

L	T	P	C
4	0	0	4

OBJECTIVES :

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

UNIT I DIFFERENTIAL CALCULUS 12

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT III INTEGRAL CALCULUS 12

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

UNIT IV MULTIPLE INTEGRALS 12

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

UNIT V DIFFERENTIAL EQUATIONS 12

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

TOTAL : 60 PERIODS

OUTCOMES :

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

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

TEXT BOOKS :

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

REFERENCES :

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

	L	T	P	C
20149S13 ENGINEERING PHYSICS	3	0	0	3

OBJECTIVS:

- 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.

20149S14 **ENGINEERING CHEMISTRY** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT 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_2-O_2 fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

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

20154S15 **ENGINEERING GRAPHICS** **L T P C**

2 4 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: 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.

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

Publication of Bureau of Indian Standards:

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

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

20150S16 **PROBLEM SOLVING AND PYTHON PROGRAMMING** **L T P C**
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.

OUTCOMES:

Upon completion of the course, students will be able to

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

TOTAL : 45 PERIODS

TEXT BOOKS:

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

REFERENCES:

1. 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.

20150L17 **PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY** **L T P C 0 0 4 2**

OBJECTIVES:

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

LIST OF PROGRAMS

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

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

OUTCOMES:

Upon completion of the course, students will be able to

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

TOTAL : 45 PERIODS

20149L18 PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programme

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: 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 viscometery.

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

14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:

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

TOTAL: 22 PERIODS

TEXTBOOKS:

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

20147S21 **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 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 cgarts, graphs- Vocabulary Development-vocabularyused 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/ talkls 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 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

20148S22 **ENGINEERING MATHEMATICS – II**

L	T	P	C
4	0	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

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, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics ", John Wiley and Sons, 10th Edition, New Delhi, 2016.

REFERENCES :

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

MATERIALS SCIENCE

		L	T	P	C
20149S23C	(Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering)	3	0	0	3

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, baintic 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 $Fe\text{-}Fe_3C$ 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.

20149S24A ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
4 0 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 17

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 11

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 13

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 10

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 9

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 60 PERIODS

OUTCOMES:

- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:

1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :

1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 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.

20153S25D 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

20154S26D **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”, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, “Engineering Mechanics”, Oxford University Press (2010)

REFERENCES:

1. Bhavikatti, S.S and Rajashekarappa, K.G., “Engineering Mechanics”, New Age International (P) Limited Publishers, 1998.
2. Hibbeller, R.C and Ashok Gupta, “Engineering Mechanics: Statics and Dynamics”, 11th Edition, Pearson Education 2010.
3. Irving H. Shames and Krishna Mohana Rao. G., “Engineering Mechanics – Statics and Dynamics”, 4th Edition, Pearson Education 2006.
4. Meriam J.L. and Kraige L.G., “ Engineering Mechanics- Statics - Volume 1, Dynamics- Volume 2”, Third Edition, John Wiley & Sons,1993.
5. Rajasekaran S and Sankarasubramanian G., “Engineering Mechanics Statics and Dynamics”, 3rd Edition, Vikas Publishing House Pvt. Ltd., 2005.

20154L27 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 17

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 16

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 **14**

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 **13**

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, foundary 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
(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

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	

20153L28D **BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY** **L T P C 0 0 4 2**

OBJECTIVE:

- To train the students in performing various tests on electrical drives, sensors and circuits.

LIST OF EXPERIMENTS:

1. Load test on separately excited DC generator
2. Load test on Single phase Transformer
3. Load test on Induction motor
4. Verification of Circuit Laws
5. Verification of Circuit Theorems
6. Measurement of three phase power
7. Load test on DC shunt motor.
8. Diode based application circuits
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: 60 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

S.No.	NAME OF THE EQUIPMENT	Qty.
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)	-

201AGIC **Indian Constitution** **L T P C**
0 0 0 2

Aim:

- To understand the salient features of the Indian Constitution

Objectives:

- To make the students understand about the Democratic Rule and Parliamentarian 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.
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.

20148S31C TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS L T P C
4 0 0 4

OBJECTIVES:

- To introduce the basic concepts of PDE for solving standard partial differential equations.
- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.
- To acquaint the student with Fourier series techniques in solving heat flow problems used in various situations.
- To acquaint the student with Fourier transform techniques used in wide variety of situations.
- To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems.

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations – Singular integrals - Solutions of standard types of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non-homogeneous types.

UNIT II FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier series – Parseval's identity – Harmonic analysis.

UNIT III APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction.UNIT IV FOURIER TRANSFORMS 12
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions – Convolution theorem – Parseval's identity.

UNIT V Z - TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TOTAL : 60 PERIODS

OUTCOMES :

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

- Understand how to solve the given standard partial differential equations.
- Solve differential equations using Fourier series analysis which plays a vital role in engineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensional heat flow problems and one dimensional wave equations.
- Understand the mathematical principles on transforms and partial differential equations would provide them the ability to formulate and solve some of the physical problems of engineering.
- Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

TEXT BOOKS :

1. Grewal B.S., "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, New Delhi, 2014.
2. Narayanan S., Manicavachagom Pillay.T.K and Ramanaiah.G "Advanced Mathematics for Engineering Students", Vol. II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES :

1. B.V Ramana.., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi, 2016.
2. Erwin Kreyszig, "Advanced Engineering Mathematics ", 10th Edition, John Wiley, India, 2016.
3. G. James, "Advanced Modern Engineering Mathematics", 3rd 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", 9th 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.

20154C32 **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 & Sonnatag, "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", 5th Edition, Tata McGraw-Hill, New Delhi, 2013.

20154C33 **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

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

20154C34 **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_2 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", 4th 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.

20154C35 **ELECTRICAL DRIVES AND CONTROLS** **L T P C**
3 2 0 4

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.

20154L36 **PRODUCTION TECHNOLOGY LABORATORY – I** **L T P C**
0 0 4 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: 60 PERIODS

OUTCOMES:

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

S. NO.	NAME OF THE EQUIPMENT	Qty.
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.

20154L37 COMPUTER AIDED MACHINE DRAWING

	L	**T**	**P**	**C**
	0	**0**	**4**	**2**

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 17

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 18

- 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 25

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: 60 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

20154L38 **ELECTRICAL ENGINEERING LABORATORY** **L T P C**
0 0 4 2

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

TOTAL: 60 PERIODS

OUTCOME:

- Ability to perform speed characteristic of different electrical machine

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S.No.	NAME OF THE EQUIPMENT	Qty.
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

20154L39 **INTERPERSONAL SKILLS/LISTENING & SPEAKING**

L	T	P	C
0	0	2	1

OBJECTIVES: The Course will enable learners to:

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

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TOTAL : 30 PERIODS

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

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

TEXT BOOKS:

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

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

REFERENCES

1. Bhatnagar, Nitin and MamtaBhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010.
2. Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3. 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.

201AGGS **INTRODUCTION TO GENDER STUDIES** **L T P C**
0 0 0 2

COURSE OUTLINE

Unit-I Concepts

Sex vs. Gender, masculinity, femininity, socialization, patriarchy, public/ private, essentialism, binaryism, power, hegemony, hierarchy, stereotype, gender roles, gender relation, deconstruction, resistance, sexual division of labour.

Unit-II

Feminist Theory

Liberal, Marxist, Socialist, Radical, Psychoanalytic, postmodernist, eco-feminist.

Unit-III

Women's Movements: Global, National and Local

Rise of Feminism in Europe and America.

Women's Movement in India.

Unit-IV

Gender and Language

Linguistic Forms and Gender.

Gender and narratives.

Unit-V

Gender and Representation

Advertising and popular visual media.

Gender and Representation in Alternative Media.

Gender and social media.

TOTAL : 30 PERIODS

20148C41D STATISTICS AND NUMERICAL METHODS

L	T	P	C
3	2	0	4

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 - 2^2 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 derivates 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^{th} 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^{th} Edition, 2015.

REFERENCES :

1. Burden, R.L and Faires, J.D, "Numerical Analysis", 9^{th} Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8^{th} 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^{th} Edition, Pearson Education, Asia, 2007.

20154C42	THEORY OF MACHINES-I	L	T	P	C
		3	2	0	4

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 – Involutes 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”, 4th 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", 3rd 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.

20154C43 PRODUCTION TECHNOLOGY – II

L	T	P	C
3	0	0	3

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", 3rd 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. Geofrey 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.

20154C44 **ENGINEERING METALLURGY**

L	T	P	C
3	0	0	3

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- α and β 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 Al2O3, SiC, Si3N4, 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 lzod 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:

1. Avner, S.H., "Introduction to Physical Metallurgy", McGraw Hill Book Company,1997.
2. 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.

20154C45	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 hollows 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 – Lame'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. Been, 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.

20154C46	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 lnjection 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:

1. Arora.C.P, ”Refrigeration and Air Conditioning ,” Tata McGraw-Hill Publishers 2008
2. Ganesan V..” Internal Combustion Engines” , Third Edition, Tata Mcgraw-Hill 2012
3. Ramalingam. K.K., "Thermal Engineering", SCITECH Publications (India) Pvt. Ltd., 2009.
4. Rudramoorthy, R, “Thermal Engineering “,Tata McGraw-Hill, New Delhi,2003
5. Sarkar, B.K,”Thermal Engineering” Tata McGraw-Hill Publishers, 2007

20154L47 PRODUCTION TECHNOLOGY LABORATORY – II

L	T	P	C
0	0	4	2

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:

1. Contour milling using vertical milling machine
2. Spur gear cutting in milling machine
3. Helical Gear Cutting in milling machine
4. Gear generation in hobbing machine
5. Gear generation in gear shaping machine
6. Plain Surface grinding
7. Cylindrical grinding
8. Tool angle grinding with tool and Cutter Grinder
9. Measurement of cutting forces in Milling / Turning Process
10. 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	Cylinderical 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

20154L48	STRENGTH OF MATERIALS AND FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

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

STRENGTH OF MATERIALS **23**

LIST OF EXPERIMENTS

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

OUTCOME:

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

LIST OF EQUIPMENT FOR BATCH OF 30 STUDENTS

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

FLUID MECHANICS AND MACHINES LABORATORY **22**

LIST OF EXPERIMENTS

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

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. NO.	NAME OF THE EQUIPMENT	Qty.
1	Orifice meter setup	1
2	Venturi meter setup	1
3	Rotameter setup	1
4	Pipe Flow analysis setup	1
5	Centrifugal pump/submergible 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

20154L 49 ADVANCED READING AND WRITING

L	T	P	C
0	0	2	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

201AGCE Community Engagement

L T P C
0 0 0 2

a) Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of learning

b) Learning Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identifyopportunities for contributing to community's socio-economic improvements

c) Credit

2 credit, 30 hours, at least 50% in field, compulsory for all students

d) Contents

Divided into four Modules, field immersion is part of each Unit

Course Structure: 2 Credits Course (1 Credit for Classroom and Tutorials and 1 Credit for Field Engagement)

S. No.	Module Title	Module Content	Assignment	Teaching/ Learning Methodology	No. of Classes
1	Appreciation of Rural Society	Rurallifestyle, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages' (Gandhi), rural infrastructure	Prepare a map (physical, visual or digital) of the village you visited and write an essay about inter-family relations in that village.	Classroom discussions Field visit** Assignment Map	2 4 2

2	*Understanding rural economy & livelihood*	Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets	Describe your analysis of rural household economy, its challenges and possible pathways to address them	Field visit** Group discussions in class Assignment	3 4 1
3	*Rural Institutions*	Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration	How effectively are Panchayati raj institutions functioning in the village? What would you suggest to improve their effectiveness? Present a case study (written or audio-visual)	Classroom Field visit** Group presentation of assignment	2 4 2
4	*Rural Development Programmes*	History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.	Describe the benefits received and challenges faced in the delivery of one of these programmes in the rural community; give suggestions about improving implementation of the programme for the rural poor.	Classroom Each student selects one program for field visit** Written assignment	2 4 2

20154C51 **THERMAL ENGINEERING – II**

L	T	P	C
3	2	0	4

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**

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**

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

UNIT III STEAM TURBINES **9**

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**

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**

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 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

TEXT BOOKS:

1. Kothandaraman, C.P., Domkundwar .S and Domkundwar A.V.,"A course in Thermal

Engineering", Dhanpat Rai & Sons, 2016.

2. Mahesh. M. Rathore, "Thermal Engineering", 1st

REFERENCES:

1. Arora .C.P., "Refrigeration and Air Conditioning", Tata Mc Graw Hill, 2008
2. Ballaney. P.L ." Thermal Engineering", Khanna publishers, 24th Edition 2012
3. Charles H Butler : Cogeneration" McGraw Hill, 1984.
4. Donald Q. Kern, " Process Heat Transfer", Tata Mc Graw Hill, 2001.

Sydney Reiter "Industrial and Commercial Heat Recovery Systems" Van Nostrand Reinhols, 1985.

20154C51 **THERMAL ENGINEERING – II**

L	T	P	C
3	2	0	4

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

REFERENCES:

5. Arora .C.P., "Refrigeration and Air Conditioning", Tata Mc Graw Hill, 2008
6. Ballaney. P.L ." Thermal Engineering", Khanna publishers, 24th Edition 2012
7. Charles H Butler : Cogeneration" McGraw Hill, 1984.
8. Donald Q. Kern, " Process Heat Transfer", Tata Mc Graw Hill, 2001.
9. Sydney Reiter "Industrial and Commercial Heat Recovery Systems" Van Nostrand Reinhols, 1985.

20154C52 DESIGN OF MACHINE ELEMENTS

L	T	P	C
3	2	0	4

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

UNIT IV ENERGY STORING ELEMENTS AND ENGINE COMPONENTS 9+6

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

UNIT V BEARINGS 9+6

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

TOTAL: 45+30= 75 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline),
2. 2010 Ansel Ugural, "Mechanical – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Design 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", Edition, Wiley, 4th 2005

20154C53 **METROLOGY AND MEASUREMENTS**

L	T	P	C
4	0	0	4

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

UNIT I BASICS OF METROLOGY 12
Introduction to Metrology – Need – Elements – Work piece, Instruments – Persons – Environment – their effect on Precision and Accuracy – Errors – Errors in Measurements – Types – Control – Types of standards.

UNIT II LINEAR AND ANGULAR MEASUREMENTS 12
Linear Measuring Instruments – Evolution – Types – Classification – Limit gauges – gauge design – terminology – procedure – concepts of interchange ability and selective assembly – Angular measuring instruments – Types – Bevel protractor clinometers angle gauges, spirit levels sine bar – Angle alignment telescope – Autocollimator – Applications.

UNIT III ADVANCES IN METROLOGY 12
Basic concept of lasers Advantages of lasers – laser Interferometers – types – DC and AC Lasers interferometer – Applications – Straightness – Alignment. Basic concept of CMM – Types of CMM
– Constructional features – Probes – Accessories – Software – Applications – Basic concepts of Machine Vision System – Element – Applications.

UNIT IV FORM MEASUREMENT 12
Principles and Methods of straightness – Flatness measurement – Thread measurement, gear measurement, surface finish measurement, Roundness measurement – Applications.

UNIT V MEASUREMENT OF POWER, FLOW AND TEMPERATURE 12
Force, torque, power - mechanical , Pneumatic, Hydraulic and Electrical type. Flow measurement: Venturimeter, Orifice meter, rotameter, pitot tube – Temperature: bimetallic strip, thermocouples, electrical resistance thermometer – Reliability and Calibration – Readability and Reliability.

TOTAL : 60 PERIODS

OUTCOMES:
Upon the completion of this course the students will be able to
- CO1 Describe the concepts of measurements to apply in various metrological instruments
- CO2 Outline the principles of linear and angular measurement tools used for industrial applications
- CO3 Explain the procedure for conducting computer aided inspection
- CO4 Demonstrate the techniques of form measurement used for industrial components
- CO5 Discuss various measuring techniques of mechanical properties in industrial applications

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

REFERENCES:

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

20154C54 **THEORY OF MACHINES-II**

L	T	P	C
3	2	0	4

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”, 4th Edition, Tata McGraw-Hill, 2014.
3. Uicker, J.J., Pennock G.R and Shigley, J.E., “Theory of Machines and Mechanisms”, 4th 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", 3rd Edition Affiliated East-West Pvt. Ltd., New Delhi, 2006.
3. Khurmi, R.S.,”Theory of Machines”, 14th Edition, S Chand Publications, 2005.
4. Rao.J.S. and Dukkipati.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.

20154L56 THEORY OF MACHINES LABORATORY

L	T	P	C
0	0	4	2

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.

20154L57	THERMAL ENGINEERING LABORATORY	L	T	P	C
		0	0	4	2

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.

20154L58	METROLOGY AND MEASUREMENTS LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVE:

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

LIST OF EXPERIMENTS

1. Calibration and use of measuring instruments – Vernier caliper, micrometer, Vernier height gauge – using gauge blocks
2. Calibration and use of measuring instruments – depth micrometer, bore gauge, telescopic gauge
3. Measurement of linear dimensions using Comparators
4. Measurement of angles using bevel protractor and sine bar
5. Measurement of screw thread parameters – Screw thread Micrometers and Three wire method '(floating carriage micrometer)
6. Measurement of gear parameters – disc micrometers, gear tooth vernier caliper
7. Measurement of features in a prismatic component using Coordinate Measuring Machine (CMM)
8. Programming of CNC Coordinate Measuring Machines for repeated measurements of identical components
9. Non-contact (Optical) measurement using Toolmaker's microscope / Profile projector and Video measurement system
10. Measurement of Surface finish in components manufactured using various processes (turning, milling, grinding, etc.,) using stylus based instruments.
11. Machine tool metrology – Level tests using precision level; Testing of straightness of a machine tool guide way using Autocollimator, spindle tests.
12. 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

20154CRM **Research Methodology** **L T P C**
0 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 – 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.

201AGIE INNOVATION AND ENTREPRENEURSHIP LTPC
0 0 0 2

Course Outcomes

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

- Comprehend the role of bounded rationality, framing, causation and effectuation in entrepreneurial decision making.
- Demonstrate an ability to design a business model canvas.
- Evaluate the various sources of raising finance for startup ventures.
- Understand the fundamentals of developing and presenting business pitching to potential investors.

Course Content

Module – I

Introduction to Entrepreneurship: Entrepreneurs; entrepreneurial personality and intentions- characteristics, traits and behavioral; entrepreneurial challenges.

Module-II

Module Entrepreneurial Opportunities: Opportunities. discovery/ creation, Pattern identification and recognition for venture creation: prototype and exemplar model, reverse engineering.

Module –III

Entrepreneurial Process and Decision Making: Entrepreneurial ecosystem, Ideation, development and exploitation of opportunities; Negotiation, decision making process and approaches, Effectuation and Causation.

Module-IV

Crafting business models and Lean Start-ups: Introduction to business models; Creating value propositions-conventional industry logic, value innovation logic; customer focused innovation; building and analyzing business models; Business model canvas, Introduction to lean startups, Business Pitching.

Module – V

Organizing Business and Entrepreneurial Finance: Forms of business organizations; organizational structures; Evolution of Organisation, sources and selection of venture finance options and its managerial implications. Policy Initiatives and focus; role of institutions in promoting entrepreneurship.

Books for References

- Ries, Eric(2011), The lean Start-up: How constant innovation creates radically successful businesses, Penguin Books Limited.
- Blank, Steve (2013), The Startup Owner's Manual: The Step by Step Guide for Building a Great Company, K&S Ranch.
- S. Carter and D. Jones-Evans, Enterprise and small business- Principal Practice and Policy, Pearson Education (2006)
- T. H. Byers, R. C. Dorf, A. Nelson, Technology Ventures: From Idea to Enterprise, McGraw Hill (2013)
- Osterwalder, Alex and Pigneur, Yves (2010) Business Model Generation.
- Kachru, Upendra, India Land of a Billion Entrepreneurs, Pearson
- Bagchi, Subroto, (2008), Go Kiss the World: Life Lessons for the Young Professional, Portfolio Penguin
- Bagchi, Subroto, (2012). MBA At 16: a Teenager's Guide to Business, Penguin Books
- Bansal, Rashmi, Stay Hungry Stay Foolish, CIIE, IIM Ahmedabad
- Bansal, Rashmi, (2013). Follow Every Rainbow, Westland.
- Mitra, Sramana (2008), Entrepreneur Journeys (Volume 1), Booksurge Publishing
- Abrams, R. (2006). Six-week Start-up, Prentice-Hall of India.
- Verstraete, T. and Laffitte, E.J. (2011). a Business Model of Entrepreneurship, Edward Elgar Publishing.
- Johnson, Steven (2011). Where Good Ideas comes from, Penguin Books Limited.
- Gabor, Michael E. (2013), Awakening the Entrepreneur Within, Primento.
- Guillebeau, Chris (2012), The $100 startup: Fire your Boss, Do what you love and work better to live more, Pan Macmillan
- Kelley, Tom (2011), The ten faces of innovation, Currency Doubleday

20154C61 **DESIGN OF TRANSMISSION SYSTEMS**

L	T	P	C
3	2	0	4

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^{th} Edition, Tata McGraw-Hill Book Co, 2016.
2. Joseph Shigley, Charles Mischke, Richard Budynas and Keith Nisbett "Mechanical Engineering Design", 8^{th} Edition, Tata McGraw-Hill, 2008.

REFERENCES:

1. Merhyle F. Spotts, Terry E. Shoup and Lee E. Hornberger, "Design of Machine Elements" 8^{th} 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^{th} Edition, Wiley, 2005
5. Sundararajamoorthy T. V, Shanmugam .N, "Machine Design", Anuradha Publications, Chennai, 2003.

20154C62 **COMPUTER AIDED DESIGN AND MANUFACTURING** **L T P C**
3 2 0 4

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

20154C63	HEAT AND MASS TRANSFER	L	T	P	C
		3	2	0	4

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

TEXT BOOKS:

1. Holman, J.P., "Heat and Mass Transfer", Tata McGraw Hill, 2000
2. Yunus A. Cengel, "Heat Transfer A Practical Approach", Tata McGraw Hill, 5th Edition 2015

REFERENCES:

1. Frank P. Incropera and David P. Dewitt, "Fundamentals of Heat and Mass Transfer", John Wiley & Sons, 1998.
2. Kothandaraman, C.P., "Fundamentals of Heat and Mass Transfer", New Age International, New Delhi, 1998.
3. Nag, P.K., "Heat Transfer", Tata McGraw Hill, New Delhi, 2002
4. Ozisik, M.N., "Heat Transfer", McGraw Hill Book Co., 1994.
5. R.C. Sachdeva, "Fundamentals of Engineering Heat & Mass transfer", New Age International Publishers, 2009

20154C64 **FINITE ELEMENT ANALYSIS**

L	T	P	C
3	2	0	4

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.

20154C65 **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 PRINICIPLES AND HYDRAULIC PUMPS 9

Introduction to Fluid power – Advantages and Applications – Fluid power systems – Types offluids - 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.

20154L67 **CAD / CAM LABORATORY**

L	T	P	C
0	0	4	2

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

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

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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

20154L68 DESIGN AND FABRICATION PROJECT

L	T	P	C
0	0	4	2

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.

20154L69	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 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.

20154C71 **POWER PLANT ENGINEERING**

L	T	P	C
4	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 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 : B*oiling Water Reactor* (BWR), P*ressurized 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.

20154C72 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”, 9th Edition, John Wiley, 1998.
3. Russell R.S and Tailor B.W, “Operations Management”, 4th Edition, PHI, 2003.
4. Mikell P. Groover, “Automation, Production, Systems and Computer Integrated Manufacturing”, Pearson Education 2001.
5. K.C. Jain & L.N. Aggarwal, “Production Planning Control and Industrial Management”, Khanna Publishers 1990.

20154C73 **MECHATRONICS**

L	T	P	C
4	0	0	4

OBJECTIVE:

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

UNIT I INTRODUCTION 12

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

UNIT II MICROPROCESSOR AND MICROCONTROLLER 9+6

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

UNIT III PROGRAMMABLE PERIPHERAL INTERFACE 9+6

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

UNIT IV PROGRAMMABLE LOGIC CONTROLLER 9+6

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

UNIT V ACTUATORS AND MECHATRONIC SYSTEM DESIGN 9+6

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

TOTAL : 45+30=75 PERIODS

OUTCOMES:

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

CO1 Discuss the interdisciplinary applications of Electronics, Electrical, Mechanical and Computer Systems for the Control of Mechanical, Electronic Systems and sensor technology.

CO2 Discuss the architecture of Microprocessor and Microcontroller, Pin Diagram, Addressing Modes of Microprocessor and Microcontroller.

CO3 Discuss Programmable Peripheral Interface, Architecture of 8255 PPI, and various device Interfacing

CO4 Explain the architecture, programming and application of programmable logic controllers to problems and challenges in the areas of Mechatronic engineering.

CO5 Discuss various Actuators and Mechatronics system using the knowledge and skills acquired through the course and also from the given case studies

TEXT BOOKS:

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

REFERENCES:

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

20154L77 **SIMULATION AND ANALYSIS LABORATORY** **L T P C**

0 0 4 2

OBJECTIVES:

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

LIST OF EXPERIMENTS A. SIMULATION

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

B. ANALYSIS

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

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 simulate the working principle of air conditioning system, hydraulic and pneumatic cylinder and cam follower mechanisms using MATLAB.

CO2 analyze the stresses and strains induced in plates, brackets and beams and heat transfer problems.

CO3 calculate the natural frequency and mode shape analysis of 2D components and beams.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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

20154L78 **MECHATRONICS LABORATORY**

L	T	P	C
0	0	4	2

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:

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

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Demonstrate the functioning of mechatronics system with various pneumatic, hydraulic and electrical systems.

CO2 Demonstrate the functioning of control systems with the help of PLC and microcontrollers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

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

20154L79 **TECHNICALSEMINAR** **L T P C**

0 0 2 1

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

TOTAL: 30 PERIODS

20154C81 **PRINCIPLES OF MANAGEMENT** **L T P C**
3 0 0 3

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:

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

REFERENCES:

1. Harold Koontz & Heinz Weihrich, "Essentials of Management", Tata McGraw Hill, 1998.
2. Robert Kreitner & Mamata Mohapatra, "Management", Biztantra, 2008.

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

20154PW83 **PROJECT WORK**

L	T	P	C
0	0	20	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.

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.

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.

201AGPE **Professional Ethics and Human Values**

L	T	P	C
0	0	0	2

OBJECTIVE:

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

UNIT I HUMAN VALUES

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

UNIT II ENGINEERING ETHICS

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

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

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

UNIT V GLOBAL ISSUES

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

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics – Concepts and Cases‖, Cengage Learning, 2009.
3. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and Engineers‖, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal Integrity and Social Responsibility‖ Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‗ Value Education', Vethathiri publications, Erode, 2011.

ELECTIVE – I (VI SEMESTER)

20154E66A **AUTOMOBILE ENGINEERING**

	L	T	P	C
	3	0	0	3

OBJECTIVES:

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

UNIT I VEHICLE STRUCTURE AND ENGINES 9

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

UNIT II ENGINE AUXILIARY SYSTEMS 9

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

UNIT III TRANSMISSION SYSTEMS 9

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

UNIT IV STEERING, BRAKES AND SUSPENSION SYSTEMS 9

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

UNIT V ALTERNATIVE ENERGY SOURCES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

1. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New

Delhi, 2002.

2. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 13th Edition 2014..

REFERENCES:

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

L T P C

20154E66B SAFETY IN ENGINEERING INDUSTIRES **3 0 0 3**

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.

20154E66C **GAS DYNAMICS AND JET PROPULSION**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basic difference between incompressible and compressible flow.
- To understand the phenomenon of shock waves and its effect on flow. To gain some basic knowledge about jet propulsion and Rocket Propulsion.

(Use of Standard Gas Tables permitted)

UNIT I BASIC CONCEPTS AND ISENTROPIC FLOWS 9

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

UNIT II FLOW THROUGH DUCTS 9

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

UNIT III NORMAL AND OBLIQUE SHOCKS 9

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

UNIT IV JET PROPULSION 9

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

UNIT V SPACE PROPULSION 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

20154E66D **FUNDAMENTALS OF NANOSCIENCE** **L T P C**
3 0 0 3

OBJECTIVE:

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

UNIT I INTRODUCTION 8

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

UNIT II GENERAL METHODS OF PREPARATION 9

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

UNIT III NANOMATERIALS 12

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

UNIT IV CHARACTERIZATION TECHNIQUES 9

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

UNIT V APPLICATIONS 7

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS :

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

REFERENCES:

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

20154E74A **RENEWABLE SOURCES OF ENERGY**

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION **9**

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

UNIT II SOLAR ENERGY **9**

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

UNIT III WIND ENERGY **9**

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

UNIT IV BIO - ENERGY **9**

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

UNIT V OTHER RENEWABLE ENERGY SOURCES **9**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

20154E74B **NON CONVENTIONAL MACHINING PROCESSES**

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION AND MECHANICAL ENERGY BASED PROCESSES 9

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

UNIT II THERMAL AND ELECTRICAL ENERGY BASED PROCESSES 9

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

UNIT III CHEMICAL AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES 9

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

UNIT IV ADVANCED NANO FINISHING PROCESSES 9

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

UNIT V RECENT TRENDS IN NON-TRADITIONAL MACHINING PROCESSES 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Explain the need for unconventional machining processes and its classification

CO2 Compare various thermal energy and electrical energy based unconventional machining processes.

CO3 Summarize various chemical and electro-chemical energy based unconventional machining processes.

CO4 Explain various nano abrasives based unconventional machining processes.

CO5 Distinguish various recent trends based unconventional machining processes.

TEXT BOOKS:

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

REFERENCES:

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

20154E74C **OPERATIONS RESEARCH** **L T P C 3 0 0 3**

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:

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.

20154E74D **TOTAL QUALITY MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVE:

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

UNIT I INTRODUCTION 9

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

UNIT II TQM PRINCIPLES 9

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

UNIT III TQM TOOLS AND TECHNIQUES I 9

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

UNIT IV TQM TOOLS AND TECHNIQUES II 9

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

UNIT V QUALITY MANAGEMENT SYSTEM 9

Introduction—Benefits of ISO Registration—ISO 9000 Series of Standards—Sector-Specific Standards—AS 9100, TS16949 and TL 9000-- ISO 9001 Requirements—Implementation—Documentation—Internal Audits—Registration--**ENVIRONMENTAL MANAGEMENT SYSTEM** Introduction—ISO 14000 Series Standards—Concepts of ISO 14001—Requirements of ISO 14001— Benefits of EMS.

TOTAL: 45 PERIODS

OUTCOME:

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

TEXT BOOK:

1. Dale H.Besterfiled, 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^{th} 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

20154E76A **ROBOTICS**

L	T	P	C
3	0	0	3

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-Various 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.

20154E76B	DESIGN OF JIGS, FIXTURES AND PRESS TOOLS	L	T	P	C
		3	0	0	3

OBJECTIVES:

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

UNIT I LOCATING AND CLAMPING PRINCIPLES: 9

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

UNIT II JIGS AND FIXTURES 9

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

UNIT III PRESS WORKING TERMINOLOGIES AND ELEMENTS OF CUTTING DIES 9

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

UNIT IV BENDING AND DRAWING DIES 9

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

UNIT V FORMING TECHNIQUES AND EVALUATION 9

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

TOTAL: 45 PERIODS

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

OUTCOMES:

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

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

CO5 Discuss the different types of forming techniques

TEXT BOOKS:

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

REFERENCES:

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

20154E76C	GENERAL ASPECTS OF ENERGY MANAGEMENT AND ENERGY AUDIT	L	T	P	C
		3	0	0	3

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

20154E76D **COMPOSITE MATERIALS**

L	T	P	C
3	0	0	3

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 (Qij), 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
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”, Maneel Dekker Inc, 1993.
5. Mallick, P.K. and Newman, S., (edition), “Composite Materials Technology: Processes and Properties”, Hansen Publisher, Munish, 1990.

20154E82A PRODUCTION PLANNING AND CONTROL

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I INTRODUCTION 9

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

UNIT II WORK STUDY 9

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

UNIT III PRODUCT PLANNING AND PROCESS PLANNING 9

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

UNIT IV PRODUCTION SCHEDULING 9

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

UNIT V INVENTORY CONTROL AND RECENT TRENDS IN PPC 9

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

1. James. B. Dilworth, ”Operations management – Design, Planning and Control for manufacturing and services” Mcgraw Hill International edition 1992.
2. Martand Telsang, “Industrial Engineering and Production Management”, First edition, S. Chand and Company, 2000.

REFERENCES:

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

20154E82B **COMPUTER INTEGRATED MANUFACTURING SYSTEMS**

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION 9

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

UNIT II PRODUCTION PLANNING AND CONTROL AND COMPUTERISED PROCESS PLANNING 9

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

UNIT III CELLULAR MANUFACTURING 9

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

UNIT IV FLEXIBLE MANUFACTURING SYSTEM (FMS) AND AUTOMATED GUIDED VEHICLE SYSTEM (AGVS) 9

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

UNIT V INDUSTRIAL ROBOTICS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOKS:

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

REFERENCES:

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

20154E82C	ENERGY EFFICIENCY IN THERMAL UTILITIES	L	T	P	C
		3	0	0	3

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

20154E82D **PROFESSIONAL ETHICS IN ENGINEERING** **L T P C**
3 0 0 3

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:

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

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. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001.
4. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003

5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.

Web sources:

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

OPEN ELECTIVE–I

20150FE54A **DATABASE MANAGEMENT SYSTEMS**

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

OBJECTIVES:

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

UNIT I DBMS AND CONCEPTUAL DATA MODELING 9

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

UNIT II DATABASE QUERYING **11**

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

UNIT III DATABASE PROGRAMMING **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.

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 Systems‖, Fourth Edition, McGraw-Hill College Publications, 2015.

20150FE54B **CLOUD COMPUTING** **L T P C**

3 0 0 3

OBJECTIVES:

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

UNIT I INTRODUCTION TO CLOUD COMPUTING 9

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

UNIT II VIRTUALIZATION 9

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

UNIT III CLOUD ARCHITECTURE, SERVICES AND STORAGE 9

NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - laaS – 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:

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.

20152FE54A	BASICS OF BIOMEDICAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

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 ELECTRODECONFIGURATIONS **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-ELECTRICALPARAMETERS **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 physiogical 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.

20152FE54B **SENSORS AND TRANSDUCERS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS **9**

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS **9**

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS **9**

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V **ALTERNATIVE ENERGY SOURCES** **9**

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

OUTCOMES:

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

Expertise in various calibration techniques and signal types for sensors. **CO2.** Apply the various sensors in the Automotive and Mechatronics applications **CO3.** Study the basic principles of various smart sensors. **CO4.** Implement the DAQ systems with different sensors for real time applications

-

TEXTBOOKS:

Ernest O Doebelin, “Measurement Systems – Applications and Design”, Tata McGraw-Hill, 2009.

2. Sawney A K and Puneet Sawney, “A Course in Mechanical Measurements and Instrumentation and Control”, 12th edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCES:

Patranabis D, “Sensors and Transducers”, 2nd Edition, PHI, New Delhi, 2010.

2. John Turner and Martyn Hill, “Instrumentation for Engineers and Scientists”, Oxford Science Publications, 1999.

3. Richard Zurawski, “Industrial Communication Technology Handbook” 2nd edition, CRC Press, 2015.

20153FE54A **INDUSTRIAL NANOTECHNOLOGY**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I NANO ELECTRONICS 9

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

UNIT II BIONANOTECHNOLOGY 9

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

UNIT III TRANSMISSION SYSTEMS 9

Nanocatalyts – 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:

Neelina H. Malsch (Ed.),Biomedical Nanotechnology, CRC Press (2005)

2. Udo H. Brinker, Jean-Luc Mieusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems,Wiley Publishers (2010).

3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).

4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).

5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).

6. Y-W. Mai,Polymer Nano composites, Woodhead publishing, (2006).

7. W.N. Chang,Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

20153FE54B **ENERGY CONSERVATION AND MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:

Understand and analyse the energy data of industries
 Carryout energy accounting and balancing
 Conduct energy audit and suggest methodologies for energy savings and
 Utilise the available resources in optimal ways

-

UNIT I INTRODUCTION 9

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

UNIT II ELECTRICAL SYSTEMS **9**

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

UNIT III THERMAL SYSTEMS **9**

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

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES **9**

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

UNIT V ECONOMICS **9**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

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

20154FE54A **RENEWABLE ENERGY SOURCES**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I PRINCIPLES OF SOLAR RADIATION 10

Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled 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

20154OE54B	**AUTOMOTIVE SYSTEMS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

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

UNIT I AUTOMOTIVE ENGINE AUXILIARY SYSTEMS 9

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

UNIT II VEHICLE FRAMES AND STEERING SYSTEM 9

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

UNIT III TRANSMISSION SYSTEMS 9

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

UNIT IV SUSPENSION AND BRAKES SYSTEMS 9

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

UNIT V ALTERNATIVE ENERGY SOURCES 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

Ganesan V. “Internal Combustion Engines”, Third Edition, Tata McGraw-Hill, 2007.

2. Jain K.K. and Asthana .R.B, “Automobile Engineering” Tata McGraw Hill Publishers, New Delhi, 2002.

3. Kirpal Singh, “Automobile Engineering”, Vol 1 & 2, Seventh Edition, Standard Publishers, New Delhi, 1997.

REFERENCES:

Heinz Heisler, “Advanced Engine Technology,” SAE International Publications USA, 1998.

2. Joseph Heitner, “Automotive Mechanics,” Second Edition, East-West Press, 1999.

3. Martin W, Stockel and Martin T Stockle , “Automotive Mechanics Fundamentals,” The Good heart –Will Cox Company Inc, USA ,1978.

4. Newton ,Steeds and Garet, “Motor Vehicles”, Butterworth Publishers,1989.

20155FE54A **AIR POLLUTION AND CONTROL ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I NTRODUCTION 7

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

UNIT II METEOROLOGY **6**

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

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

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

UNIT IV CONTROL OF GASEOUS CONTAMINANTS **11**

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

UNIT V INDOOR AIR QUALITY MANAGEMENT **10**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

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

TEXTBOOKS:

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.

20155FE54B **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 ELECTIVEII

20150FE74A INTRODUCTION TO C PROGRAMMING L T P C
3 0 0 3 OBJECTIVES

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

UNIT I INTRODUCTION **9** Structure of C program – Basics: Data Types – Constants –Variables - Keywords – Operators: Precedence and Associativity - Expressions - Input/Output statements, Assignment statements – Decision-making statements - Switch statement - Looping statements – Pre-processor directives - Compilation process – Exercise Programs: Check whether the required amount can be withdrawn based on the available amount – Menu-driven program to find the area of different shapes – Find the sum of even numbers Text Book: ReemaThareja (Chapters 2,3)

UNIT II ARRAYS **9** Introduction to Arrays – One dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Traversal, Insertion, Deletion, Searching - Two dimensional arrays: Declaration – Initialization - Accessing elements – Operations: Read – Print – Sum – Transpose – Exercise Programs: Print the number of positive and negative values present in the array – Sort the numbers using bubble sort - Find whether the given is matrix is diagonal or not. Text Book: ReemaThareja (Chapters 5)

UNIT III STRINGS **9**
Introduction to Strings - Reading and writing a string - String operations (without using built-in string functions): Length – Compare – Concatenate – Copy – Reverse – Substring – Insertion – Indexing – Deletion – Replacement – Array of strings – Introduction to Pointers – Pointer operators – Pointer arithmetic - Exercise programs: To find the frequency of a character in a string - To find the number of vowels, consonants and white spaces in a given text - Sorting the names. Text Book: ReemaThareja (Chapters 6 & 7)

UNIT IV FUNCTIONS **9** Introduction to Functions – Types: User-defined and built-in functions - Function prototype - Function definition - Function call - Parameter passing: Pass by value - Pass by reference - Built-in functions (string functions) – Recursive functions – Exercise programs: Calculate the total amount of power consumed by 'n' devices (passing an array to a function) – Menu-driven program to count the numbers which are divisible by 3, 5 and by both (passing an array to a function) – Replace the punctuations from a given sentence by the space character (passing an array to a function) Text Book: ReemaThareja (Chapters 4)

UNIT V STRUCTURES **9** Introduction to structures – Declaration – Initialization – Accessing the members – Nested Structures – Array of Structures – Structures and functions – Passing an entire structure – Exercise programs: Compute the age of a person using structure and functions (passing a structure to a function) – Compute the number of days an employee came late to the office by considering his arrival time for 30 days (Use array of structures and functions) Text Book: ReemaThareja (Chapters 8)

TOTAL:45 PERIODS

OUTCOMES

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

• Develop simple applications using basic constructs
• Develop applications using arrays and strings
• Develop applications using functions and structures

TEXT BOOK

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

REFERENCES:

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

20150FE74B **DATA STRUCTURES AND ALGORITHMS** **L T P C**
3 0 0 3

OBJECTIVES:

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

UNIT I ALGORITHM ANALYSIS, LIST ADT 11

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

UNIT II STACKS AND QUEUES 7

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

UNIT III SEARCHING AND SORTING ALGORITHMS 10

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

UNIT IV TREES 9

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

UNIT V GRAPHS 8

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

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

20152FE74A **ROBOTICS** **L T P C**
3 0 0 3

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 Fingered and Three Fingered Grippers; Internal Grippers and External Grippers; Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION **12**
Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual 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-Various 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.

20152FE74B ELECTRONIC DEVICES L T P C 3 0 0 3

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 diodeZener 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^{th} 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^{TH} Edition, McGraw Hill, 2016.

REFERENCES:

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

20153FE74A **BASIC CIRCUIT THEORY** **L T P C**
3 0 0 3

OBJECTIVES:

 To introduce electric circuits and its analysis
 To impart knowledge on solving circuit equations using network theorems
 To introduce the phenomenon of resonance in coupled circuits.
 To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 9

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNITIII AC CIRCUITS 9

Introduction to AC circuits , inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV THREE PHASE CIRCUITS 9

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

 Ability to introduce electric circuits and its analysis
 Ability to impart knowledge on solving circuit equations using network theorems
 Ability to introduce the phenomenon of resonance in coupled circuits.
 Ability to introduce Phasor diagrams and analysis of three phase circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering CircuitsAnalysis", 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.

20153FE74B INTRODUCTION TO RENEWABLE ENERGY SYSTEMS **L T P C**
3 0 0 3

OBJECTIVES:

To Provide knowledge

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

UNIT I INTRODUCTION **9**

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

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION

Reference theory fundamentals-principle of operation and analysis: IG and PMSG 9

UNIT III POWER CONVERTERS **9**

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

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS **9**

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

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS **9**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXT BOOK:

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

REFERENCES:

1. Rashid .M. H “power electronics Hand book”, Academic press, 2001.
2. Ion Boldea, “Variability speed generators”, Taylor & Francis group, 2006.
3. Rai. G.D, “Non conventional energy sources”, Khanna publishes, 1993.
4. Gray, L. Johnson, “Wind energy system”, prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, „Introduction to Modern Power Electronics‟, Second edition, wiley

20154FE74A **INDUSTRIAL SAFETY** **L T P C**
3 0 0 3

OBJECTIVES :
To impart knowledge on safety engineering fundamentals and safety management practices.

UNIT I INTRODUCTION 9
Evolution of modern safety concepts – Fire prevention – Mechanical hazards – Boilers, Pressure vessels, Electrical Exposure.

UNIT II CHEMICAL HAZARDS 9
Chemical exposure – Toxic materials – Ionizing Radiation and Non-ionizing Radiation - Industrial Hygiene – Industrial Toxicology.

UNIT III ENVIRONMENTAL CONTROL 9
Industrial Health Hazards – Environmental Control – Industrial Noise - Noise measuring instruments, Control of Noise, Vibration, - Personal Protection.

UNIT IV HAZARD ANALYSIS 9
System Safety Analysis –Techniques – Fault Tree Analysis (FTA), Failure Modes and Effects Analysis (FMEA), HAZOP analysis and Risk Assessment

UNIT V SAFETY REGULATIONS 9
Explosions – Disaster management – catastrophe control, hazard control ,Safety education and training - Factories Act, Safety regulations Product safety – case studies
.

TOTAL : 45 PERIODS

OUTCOMES:

 Students must be able to identify and prevent chemical, environmental mechanical, fire hazard through analysis and apply proper safety techniques on safety engineering and management
.

TEXT BOOK:
1. John V.Grimaldi, “Safety Management”, AITB S Publishers, 2003.

REFERENCES:
1. Safety Manual, “EDEL Engineering Consultancy”, 2000.
2. David L.Goetsch, “Occupational Safety and Health for Technologists”, 5th Edition, Engineers and Managers, Pearson Education Ltd., 2005.

20154FE74B **TESTING OF MATERIALS** **L T P C**
3 0 0 3

OBJECTIVE:
To understand the various destructive and non destructive testing methods of materials and its industrial applications.

UNIT IINTRODUCTION TO MATERIALS TESTING **9** Overview of materials, Classification of material testing, Purpose of testing, Selection of material, Development of testing, Testing organizations and its committee, Testing standards, Result Analysis, Advantages of testing.

UNITII MECHANICAL TESTING **9**
Introduction to mechanical testing, Hardness test (Vickers, Brinell, Rockwell), Tensile test, Impact test (Izod, Charpy) - Principles, Techniques, Methods, Advantages and Limitations, Applications. Bend test, Shear test, Creep and Fatigue test - Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT III NON DESTRUCTIVE TESTING **9** Visual inspection, Liquid penetrant test, Magnetic particle test, Thermography test – Principles, Techniques, Advantages and Limitations, Applications. Radiographic test, Eddy current test, Ultrasonic test, Acoustic emission-Principles, Techniques, Methods, Advantages and Limitations, Applications.

UNIT IV MATERIAL CHARACTERIZATION TESTING **9** Macroscopic and Microscopic observations, Optical and Electron microscopy (SEM and TEM) Principles, Types, Advantages and Limitations, Applications. Diffraction techniques, Spectroscopic Techniques, Electrical and Magnetic Techniques- Principles, Types, Advantages and Limitations, Applications.

UNIT V OTHER TESTING **9**
Thermal Testing: Differential scanning calorimetry, Differential thermal analysis. Thermo-mechanical and Dynamic mechanical analysis: Principles, Advantages, Applications. Chemical Testing: X-Ray Fluorescence, Elemental Analysis by Inductively Coupled Plasma-Optical Emission Spectroscopy and Plasma-Mass Spectrometry.

TOTAL: 45 PERIODS

OUTCOMES:
- Identify suitable testing technique to inspect industrial component
- Ability to use the different technique and know its applications and limitations

TEXT BOOKS:

1. Baldev Raj, T.Jayakumar, M.Thavasimuthu “Practical Non-Destructive Testing”, Narosa Publishing House, 2009.
2. Cullity, B. D., “Elements of X-ray diffraction”, 3rdEdition, Addison-Wesley Company Inc., New York, 2000.
3. P. Field Foster, “The Mechanical Testing of Metals and Alloys” 7th Edition, Cousens Press, 2007.

REFERENCES:

1. Metals Handbook: Mechanical testing, (Volume 8) ASM Handbook Committee, 9 Edition, American Society for Metals, 1978.

2. ASM Metals Handbook, “Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA.
3. Brandon D.G., “Modern Techniques in Metallography”, Von Nostrand Inc. NJ, USA, 1986.

20155FE74A **GREEN BUILDING DESIGN** **L T P C**
3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental Implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009. 3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.
3.

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke

20155FE74B **WASTE WATER TREATMENT** **L T P C**

3 0 0 3

OBJECTIVES

 To make the student conversant with the water treatment methods including adsorption and oxidation process.

 To provide basic under standings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT **9**

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

UNIT II INDUSTRIAL WATER TREATMENT **9**

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

UNIT III CONVENTIONAL TREATMENT METHODS **9**

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

UNIT IV WASTEWATER TREATMENT **9**

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

UNIT V ADSORPTION AND OXIDATION PROCESSES **9**

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

TOTAL: 45 PERIODS

OUTCOMES

 Will have knowledge about adsorption and oxidation process.

 Will gain idea about various methods available for water treatment.

 Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:

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

REFERENCES

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

PRIST DEEMED TO BE UNIVERSITY

School of Engineering & Technology

Department of Mechanical Engineering

Mapping of Courses to Cross cutting Issues

B.Tech Mechanical Engineering (R - 2020)

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainability and Human Values	Human Values	Professional Ethics
B.Tech - 20UGMECHFT	20154C51	Thermal Engineering- II	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C52	Design of Machine Elements	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C53	Metrology and Measurements	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C55	Theory of Machines-II	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L56	Theory of Machines Laboratory	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L57	Thermal Engineering Laboratory	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L58	Metrology and Measurements Laboratory	-	-	-	-	-
B.Tech - 20UGMECHFT	201AGIE	Innovation and Entrepreneurship	-	-	-	-	✔

B.Tech - 20UGMECHFT	20154C61	Design of Transmission Systems	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C62	Computer Aided Design And Manufacturing	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C63	Heat and Mass Transfer	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C64	Finite Element Analysis	-	-	-	-	-
B.Tech - 20UGMECHFT	20154C65	Hydraulics And Pneumatics	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L67	CAD / CAM Laboratory	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L68	Design and Fabrication Project	-	-	-	-	-
B.Tech - 20UGMECHFT	20154L69	Professional Communication	✔	-	-	-	-
B.Tech - 20UGMECHFT	201ASTT	Technical Training	-	✔	-	-	-
B.Tech - 20UGMECHFT	20154E66A	Automobile Engineering	-	-	-	-	-
B.Tech - 20UGMECHFT	20154E66B	Artificial and Neural Network	-	-	-	-	-
B.Tech - 20UGMECHFT	20154E66C	Refrigeration and Air Conditioning	-	-	-	-	-
B.Tech - 20UGMECHFT	20154E66D	Machine Tool Design	-	-	-	-	-
B.Tech - 20UGMECHFT	20154E66E	Plant Layout and Material handling	-	-	-	-	-

B.Tech - 20UGMECHFT	20150OE54A	Data Base management systems	-	-	-	-	-
B.Tech - 20UGMECHFT	20150OE54B	Cloud computing	-	-	-	-	-
B.Tech - 20UGMECHFT	20152OE54A	Basics Of Bio Medical Instrumentation	-	-	-	-	-
B.Tech - 20UGMECHFT	20152OE54B	Sensors And Transducers	-	-	-	-	-
B.Tech - 20UGMECHFT	20153OE54A	Industrial Nano Technology	-	-	-	-	-
B.Tech - 20UGMECHFT	20153OE54B	Energy Conservation and Management	-	-	-	-	-
B.Tech - 20UGMECHFT	20155OE54A	Air Pollution And Control Engineering	-	-	-	-	-
B.Tech - 20UGMECHFT	20155OE54B	Geographic Information Systems	-	-	-	-	-
B.Tech - 20UGMECHFT	20154FE54A	Renewable energy sources	-	-	-	-	-
B.Tech - 20UGMECHFT	20154OE54B	Automotive Systems	-	-	-	-	-

SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

B. Sc., MICROBIOLOGY
Academic year 2020-2021
2020 REGULATION
Mapping of courses to Cross cutting Issues

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Human Values	[illegible]	[illegible]	Sustainability	[illegible]
Microbiology & B. Sc	[illegible]	Microbiology of [illegible]					
Microbiology & B. Sc	[illegible]	Bio Chemistry I					
Microbiology & B. Sc	[illegible]	Microbiology Lab					
Microbiology & B. Sc	[illegible]	Lab Chemistry I					
Microbiology & B. Sc	[illegible]	Indian Constitution					
Microbiology & B. Sc	[illegible]	[illegible] Human					
Microbiology & B. Sc	[illegible]	Physiology					
Microbiology & B. Sc	[illegible]	Bio Chemistry II					
Microbiology & B. Sc	[illegible]	Physiology Lab					
Microbiology & B. Sc	[illegible]	Lab Chemistry II					
Microbiology & B. Sc	[illegible]	[illegible]					
Microbiology & B. Sc	[illegible]	[illegible]					
Microbiology & B. Sc	[illegible]	Immunology					
Microbiology & B. Sc	[illegible]	Cell Biology					
Microbiology & B. Sc	[illegible]	Immunology Lab					
Microbiology & B. Sc	[illegible]	Cell Biology Lab					
Microbiology & B. Sc	[illegible]	Methodology					
[illegible] & B. Sc	[illegible]	Office Automation					

[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	Proteomics					
[illegible]	[illegible]	Bioinoculants					
[illegible]	[illegible]	Molecular Immunology					
[illegible]	[illegible]	Algae Biotechnology					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	Recombinant DNA Technology					
[illegible]	[illegible]	Bioethics					
[illegible]	[illegible]	Microbiome					
[illegible]	[illegible]	Nanotechnology					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					
[illegible]	[illegible]	[illegible]					

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

M. Sc., Syllabus
Academic year 2020-2021
2020 REGULATION
Mapping of courses to Cross cutting Issues

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Human Values	[illegible]	Values	Sustainability	& Human Values
[illegible]	[illegible]	Microbiology		*			
[illegible]	[illegible]	Microbiology		*			
[illegible]	[illegible]	Microbial Physiology			*		
[illegible]	[illegible]	Microbiology Lab					*
[illegible]	[illegible]	Elective [illegible]					
[illegible]	[illegible]	Research Led Seminar	*				
[illegible]	[illegible]	Immunotechnology			*		
[illegible]	[illegible]	Bioremediation and Waste Management				*	
[illegible]	[illegible]	Industrial Microbiology			*		
[illegible]	[illegible]	Microbiology and [illegible]				*	
[illegible]	[illegible]	Clinical Microbiology			*		
[illegible]	[illegible]	[illegible] Microbiology Lab			*		

[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]					*
[illegible]	[illegible]	Genomics and Proteomics		*			*
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]				*	
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]				*	
[illegible]	[illegible]	[illegible]				*	
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	Plant Tissue Culture	*				
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]			*		
[illegible]	[illegible]	[illegible]					*
[illegible]	[illegible]	[illegible]			*		
[illegible]	[illegible]	[illegible]			*		
[illegible]	[illegible]	[illegible]	*				
[illegible]	[illegible]	[illegible]	*				

[illegible]biology &	[illegible]	Bioethics and IPR			*		
[illegible]biology &	[illegible]	Molecular Immunology			*		

DEPARTMENT OF MICROBIOLOGY

M.PHIL MICROBIOLOGY SYLLABUS - REGULATION 2020

Cross cutting

Programme Name & Code	Course Code	Title of the Course	Cross cutting issues				
			[illegible]&Values	[illegible]Ethics	Values	Sustainability	Human Values
[illegible]	**203_ _ _11** (Common Paper)	Research Methodology					
[illegible]	**203MBC12**	Advanced Microbiology					
[illegible]	**203MBC13_**	A. Microbial Biotechnology				*	
[illegible]		B .Bioprocess and Enzyme Engineering					

[illegible]	CPE_RPE (Common Paper)	Research and Publication Ethics					*
[illegible]	**203MBC21**	Project Work					*

1.3.1 SUPPORTING DOCUMENTS

Courses (offered in 2020-21) which address the Gender Sensitization, Human Values, Professional Ethics, Environment and sustainability.

SCHOOL OF ARTS AND SCIENC

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Gender Sensitization and Human Values	
Professional Ethics	
Human Values	
Environment and sustainability	
Professional Ethics & Human Values	

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

B. Sc., MICROBIOLOGY-REGULATION 2020
COURSE STRUCTURE

SEMESTER I					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
20110AEC11/ 20111AEC11/ 20132AEC11/ 20135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I	4	0	0	2
20111AEC12	English-I	4	0	0	2
20116AEC13	Fundamentals of Microbiology	6	1	0	5
20115AEC14	Bio Chemistry I	6	1	0	4
PRACTICAL					
20116AEC15L	Fundamentals of Microbiology Lab	0	0	3	2
20115AEC16L	Bio Chemistry I Lab	0	0	3	2
	Total	**20**	**2**	**6**	**17**
AUDIT COURSE					
201ACLSICN	Indian Constitution	-	-	-	2
201ACLSUHV	Universal Human Values	-	-	-	**2**
SEMESTER – II					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
20110AEC21/ 20111AEC21/ 20132AEC21/ 20135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
20111AEC22	English-II	4	0	0	2
20116AEC23	Microbial Physiology	6	1	0	5
20115AEC24	Bio Chemistry II	6	1	0	4
PRACTICAL					
20116AEC25L	Microbial Physiology Lab	0	0	3	2
20115AEC26L	Bio Chemistry II Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					

20116RLC27	Research Led Seminar	-	-	-	1
	Total	**20**	**2**	**6**	**18**
	AUDIT COURSES				
201ACLSCOS	Communication Skills	**-**	**-**	**-**	**2**
201ACSSBBE	Basic Behavioral Etiquette	**-**	**-**	**-**	**2**
	SEMESTER – III				
Course Code	**Course Title**	**L**	**T**	**P**	**C**
	THEORY				
20110AEC31/ 20111AEC31/ 20132AEC31/ 20135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
20111AEC32	English-III	4	0	0	2
20116AEC33	Immunology	4	1	0	4
20116AEC34	Cell Biology	4	1	0	5
	PRACTICAL				
20116AEC35L	Immunology Lab	0	0	3	2
20116AEC36L	Cell Biology Lab	0	0	3	2
	RESEARCH SKILL BASED COURSE				
20116RMC37	Research Methodology	2	0	0	2
	Total	**18**	**2**	**6**	**19**
	AUDIT COURSE				
201ACLSOAN	Office Automation	**-**	**-**	**-**	**2**
	SEMESTER – IV				
Course Code	**Course Title**	**L**	**T**	**P**	**C**
	THEORY				
20110AEC41/ 20111AEC41/ 20132AEC41/ 20135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
20111AEC42	English-IV	4	0	0	2

20116AEC43	Virology	4	1	0	4
20116AEC44	Biostatistics and Bioinformatics	5	1	0	5
201ENSTU45	Environmental studies	2	0	0	2
PRACTICAL					
20116AEC46L	Virology Lab	0	0	3	2
20116AEC47L	Biostatistics and Bioinformatics Lab	0	0	3	2
	Total	**19**	**2**	**6**	**19**
AUDIT COURSE					
201ACLSLMS	Leadership and Management Skills	-	-	-	**2**
201ACSSAQA	General Aptitude and Quantitative Ability	-	-	-	**2**
SEMESTER – V					
Course Code	**Course Title**	**L**	**T**	**P**	**C**
THEORY					
20116AEC51	Food and Dairy Microbiology	4	1	0	4
20116AEC52	Molecular Biology	4	1	0	3
20116AEC53	Agricultural and Environmental Microbiology	4	1	0	4
20116DSC54__	Discipline Specific Elective -I	4	1	0	3
PRACTICAL					
20116AEC55L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	2
20116AEC56L	Agricultural and Environmental Microbiology Lab	0	0	3	2
RESEARCH SKILL BASED COURSE					
20116BRC57	Participation in Bounded Research	-	-	-	1
	Total	**16**	**4**	**6**	**19**
AUDIT COURSE					
201ACLSPSL	Professional Skills	-	-	-	**2**
SEMESTER – VI					

Course Code	Course Title	L	T	P	C
THEORY					
20116AEC61	Industrial Microbiology	4	1	0	4
20116SEC62	Clinical Microbiology	4	1	0	5
20116DSC63_	Discipline Specific Elective - II	4	1	0	3
201—OEC (2 DIGIT COURSE Name)	Open Elective	4	0	0	2
PRACTICAL					
20116AEC64L	Industrial Microbiology Lab	0	0	3	2
20116SEC65L	Clinical Microbiology Lab	0	0	3	2
20116PRW66	Project Work	-	-	-	4
20116PROEE	Program Exit Examination	-	-	-	1
	Total	**16**	**3**	**6**	**23**
AUDIT COURSE					
201ACSSIST	Interview Skills Training and Mock Test	-	-	-	**2**
201ACLSCET	Community Engagement	-	-	-	**1**
Total Credits -Programme					**115**
Total Credits - Audit Courses					**19**

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 20116DSC54A - Proteomics b) 20116DSC54B - Bioinoculants c) 20116DSC54C-Molecular Immunology d)20116DSC54D- Algae Biotechnology
	Discipline Specific Elective Courses-I
VI	a) 20116DSC63A-Recombinant DNA Technology b) 20116DSC63B - Bioethics c)20116DSC63C -Microbiome d)20116DSC63D-Tissue Culture e)20116DSC63E-Nanotechnology

Open Electives

Semester	Open Elective Courses
VI	a) 201TNOEC-Tamil Ilakkiya Varalaru b) 201ENOEC-Journalism c) 201MAOEC-Development of Mathematical Skills d) 201PHOEC-Instrumentation e) 201CEOEC-Food and Adulteration f) 201CSOEC – E-Learning g) 201CAOEC-Web Technology h) 201CMOEC-Banking service

Credit Distribution

Sem	AEC	SEC	DSC	OEC	Research	Others	Total
I	17	-	-	-	-	-	17
II	17	-	-	-	1	-	18
III	17	-	-	-	2	-	19
IV	17	-	-	-	-	2	19
V	15	-	3	-	1	-	19
VI	6	7	3	2	4	1	23
Total	**89**	**7**	**6**	**2**	**8**	**3**	**115**

Course Code	Course Title	L	T	P	C
20110AEC11	Tamil-I	4	0	0	2

SEMESTER I

பிரிஸ்ட் நிகர்நிலைப் பல்கலைக்கழகம்- வல்லம், தஞ்சாவூர்

பாட குறியாடு :

தமிழ் முதல் பருவம்

முதலாம் ஆண்டு

இக்கால இலக்கியம் - செய்யுள், சிறுகதை , நாடகம், இலக்கிய வரலாறு

அலகு : 1.செய்யுள்

1. தாயுமானவ சுவாமிகள் - ஆதார புவனம் - சிதம்பர ரகசியம் - 40 அடிகள்

2. இராமலிங்க அடிகள் - திருவருட்பா - கருணை விண்ணப்பம் - 40 அடிகள்

3. கவிமணி தேசிக விநாயகம் பிள்ளை - மலரும் மாலையும் - 52 அடிகள்

4. பாரதியார் - புதுமைப்பெண் - 40 அடிகள்

5. பாரதிதாசன் - பாரதிதாசன் கவிதைகள் ,தமிழ் இனிமை , தமிழ் உணவு

அலகு : 2. செய்யுள்:

6 . நாமக்கல் கவிஞர் - தமிழ் தேன் - தமிழ் வளர்க்க சபதம் செய்வோம் , 40 அடிகள்

7. ந.பிச்சமூர்த்தி - வழித்துணை - கவிதை கருடன் , 42 அடிகள்

8.சுரதா - தேன்மழை, கலப்பை , 22 அடிகள்

9. கண்ணதாசன் - இலக்கியம் , ஒரு பானையின் கதை , 54 அடிகள்

10. அப்துல் ரகுமான் - சொந்த சிறகுகள், குப்பையை கிளறும் சிறகுகள், 80 அடிகள்

அலகு : 3. சிறுகதை :

11. சு.சமுத்திரம் - வேரில் பழுத்த பலா

அலகு : 4. நாடகம் :

12. கு. வெ. பாலசுப்பிரமணியன் , கௌதம புத்தர் (உரைநடை நாடகம்)

அலகு : 5. இலக்கிய வரலாறு

13. சிறுகதை , புதினம், நாடகம் உரைநடை , கவிதை , புதுக்கவிதை

Course Code	Course Title	L	T	P	C
20111AEC11	Advanced English-I	4	0	0	2

Aim:
- To improve the knowledge of English

Objective:
- To familiarize with the glossary terms, figures of speech
- To enhance vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:
- Develop vocabulary
- Learn to edit and do proof reading
- Read and comprehend literature

UNIT –I
Glossary of grammar terms
Figures of speech
UNIT – II
Foreign words and phrases
British and American Vocabulary
UNIT – III
Comparison and contrast
Cause and effect
UNIT – IV
Editing
Proof reading
UNIT – V
Speeches of famous people:
Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

Reference book:

Author	Title of the book	Edition / Year	Publisher
Wren and Martin	English Grammar	2009	S.Chand & Company Ltd
Meenakshi Raman & Sangeetha Sharma	Technical Communication	Second Edition 2011	Oxford University Press
Sudhir Kumar Sharma	The World's Great Speeches	-	Galaxy Publishers

Course Code	Course Title	L	T	P	C
20111AEC12	English-I	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature
- Appreciate the different types of poetry and prose

UNIT –I

Because I could not Stop for Death -Emily Dickinson
Stopping by Woods on a Snowy Evening -Robert Frost

UNIT – II

Enterprise -Nissim Ezekiel
Love poem for a wife -A.K Ramanujam

UNIT –III

The Art of Reading - Lin Yutang
An Eco-Feminist Vision -Aruna Gnanadason

UNIT –IV

The Merchant of Death -Nanda Kishore Mishra & John Kennet
She Spoke for all Nature -Young world 'The Hindu'

UNIT –V

Oliver Twist -Charles Dickens

Text book:

Author	Title of the book	Edition / Year	Publisher
S.Murugesan/ Dr.K.Chellappan	The Art of Reading/ Experiencing Poetry	Reprint 2004	Emerald Publishers

Course Code	Course Title	L	T	P	C
20116AEC13	Fundamentals of Microbiology	6	1	0	5

Aim

- To impart the basic principles and applications of microorganism

Objectives

- To provide a essential informations of microorganism for progressive and applied reforms in biological sciences for human welfare

Out Comes

CO1 – To Describe the characteristics of microorganisms and classification

CO2 – To Understand the concepts of growth and reproduction of microbes

CO3 – To explain the beneficial and detrimental effects of microorganisms

CO4 - To Gather theoretical background of microbial cultivation

Unit – I

Introduction – definition, scope and history of microbiology, differences between the prokaryotic and eukaryotic microorganisms. Classification of microorganisms – general principles and nomenclature – Haeckel's three kingdom concept, Whittaker's five kingdom concept – Classification and characterization of bacteria according to Bergey's manual of Systematic Bacteriology. Basic understanding of classification of viruses, algae, fungi and protozoa.

Unit – II

Microscopy: Principles and application of simple, compound, bright field, dark field, phase contrast, fluorescent and Electron microscopy. Principles of staining: Nature of dyes, types of staining – simple, differential, negative and spore staining. Sterilization: Principles and methods – physical and chemical.

Unit – III

General characteristics and nature of archacbacteria, Eubacteria, Cyanobacteria, Ricketsiae, Chlamydiae, Spirochaetes, Actinomycetes, Protozoa, Viruses including phages, Mycoplasmas, Algae and fungi.

Unit – IV

Microbial Cell: Ultrastructure of bacteria, subcellular structures and cell envelope – slime, capsule, cell wall, pili, flagella, cell inclusions, biosynthesis of bacterial cell wall, cell membrane – Biomembrane, liposomes – membrane transport – diffusion, active and passive transport and osmoregulation

Unit – V

Culture techniques: types of media simple, defined, enriched and transport media with specific examples for each type. Methods of maintenance and preservation of cultures

Text book:

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5^{th} /1993	Tata McGraw-Hill, Inc, Newyork

Reference Book:

1. Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London.
2. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20115AEC14B	Bio Chemistry I	6	1	0	4

Aim

- To provide the basic of biochemistry and its application.

Objectives

- It serves as good research techniques and the ability to combine and analyzeinformation.

Outcomes

CO1 – To Develop fundamental knowledge about various biomolecules

CO2 - To Understand the basic concepts related to enzymes

CO3 - To Know various biochemical pathway

CO4 - To Understand the concept of microbial metabolism.

Unit I

Carbohydrates: Definition, Classification and Properties; Structural Elucidation of Glucose and fructose; Biological Functions of Glucose, fructose, starch, Cellulose, Chitin and Heparin.

Unit II

Amino acids: Structure, Classification, Properties.

Peptides: Amides and Peptides, Peptide bond, Peptide synthesis, Biologically important Peptides.

Proteins: Biological importance, Classification, properties; Structural orders; Protein stability; Separation and purification of proteins.

Unit III

Nucleotides and Polynucleotides; Terminology –Components.DNA and RNA – Composition, Structure, their biological importance.

Unit IV

Lipids: Biological Significance, Classification of lipids. Analysis of oils – Iodine Number, Saponification Value, Acid number, Acetyl value and Reichert-Meisel value; Qualitative Tests for Lipids.

Unit V

Vitamins: Source, Structure of Biological Role requirement, deficiency manifestation of fat soluble (A, D, E and K) and water soluble (B complexes and C) vitamins.

References:

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^{th} edn., McGraw Hill.

Course Code	Course Title	L	T	P	C
20116AEC15L	Fundamentals of Microbiology Lab	0	0	3	2

Aim

- To understand the basic principles of Microbiology laboratory.

Objectives

- Microbiology laboratory guidelines and necessary equipment
- Isolation methods for microorganisms.
- Various staining techniques for the observation of microbes.

Outcomes

CO1 – To Develop basic skills in aseptic techniques formicrobiology practical.

CO2 – To gain Hands on experience in handling ofvarious important instruments.

CO3 - Able to perform basic experiments to grow and study microorganism in laboratory

CO4 - To Develop knowledge on identification of microorganisms.

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 hystolytica* 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

Course Code	Course Title	L	T	P	C
20115AEC16BL	Bio Chemistry I Lab	0	0	3	2

Aim

- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

- To familiarize the students with the basic cellular processes at molecular level

Outcomes

CO1 - To gain Practical knowledge about various techniques used in Biochemistry

CO2 - To Exhibit the well practical knowledge about estimation of carbohydrates, protein.

CO3 – To Learn the quantitative and qualitative estimation biochemical analysis.

1. Qualitative Analysis of Carbohydrate.
2. Qualitative Analysis of Proteins.
3. Colour Reactions for Amino Acids.

Course Code	Course Title	L	T	P	C
201ACLSICN	Indian Constitition	-	-	-	2

Objectives:

1. To make the students understand about the democratic rule and parliamentarian administration
2. To appreciate the salient features of the Indian constitution
3.To know the fundamental rights and constitutional remedies
4. To make familiar with powers and positions of the union executive,union parliament and the supreme court

To exercise the adult franchise of voting and appreciate the electoral system of Indian democracy.

Outcome

CO1- To gain Democratic values and citizenship Training

CO2- To know the Awareness on fundamental Rights are established

CO3- To learn the functions of union Government and State Government

CO4- To learn the Power and functions of the Judiciary thoroughly

CO5- To learn the Appreciation of Democratic Parliamentary Rule

Unit I::The making of Indian constitution

The constitution assembly organization –character -work salient features of the constitution- written and detailed constitution -socialism –secularism-democracy and republic.

Unit II: Fundamental rights and fundamental duties of the citizens

Right of equality -right of freedom- right against exploitation -right to freedom of religion- cultural and educational rights -right to constitutional remedies -fundamental duties .

Unit III: Directive principles of state policy

Socialistic principles-Gandhi an principles-liberal and general principles -differences between fundamental rights and directive principles

Unit IV: The union executive, union parliament and Supreme Court

Powers and positions of the president -qualification _method of election of president and vice president -prime minister -Rajya Sabah -Lok Sabah .the supreme court -high court -functions and position of supreme court and high court

Unit V: State council -election system and parliamentary democracy in India

State council of ministers -chief minister -election system in India-main features election commission-features of Indian democracy.

References:

1) Palekar.s.a. Indian constitution government and politics, ABD publications, India
2) Aiyer, alladi krishnaswami, Constitution and fundamental rights 1955.
3) Markandan. k.c.directive Principles in the Indian constitution 1966.
4) Kashyap. Subash c, Our parliament ,National book trust , New Delhi 1989

Course Code	Course Title	L	T	P	C
201ACLSUHV	Universal Human Values	-	-	-	2

Aim:

This course aims at making learners conscious about universal human values in an integralmanner, 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 realiseone'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? Formsoflove—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 thisvalue

- Narratives and anecdotes from history, literature including localfolklore
- Practicing Truth: What will learners learn/gain if they practice truth? What will learners lose if they don't practiceit?
- 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 anecdotesaboutnon-violence from history,and literature including local folklore
- Practicingnon-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
- Simulatedsituations
- Casestudies

Unit VI

- Introduction: What is service? Forms of service for self, parents, family, friend, spouse, community, nation, humanity and other beings—living and non-living, persons in distress ordisaster.
- Individuals who are remembered in history for practicing this value.
- Narratives and anecdotes dealing with instances of service from history, literature including local folklore
- Practicingservice: What will learners learn/gain 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-restrainand 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 practiceit?
- Sharing learners' individual and/or group experience(s)
- Simulated situations
- Casestudies

Course Code	Course Title	L	T	P	C

20110AEC21	Tamil-II	4	0	0	2

தமிழ் இரண்டாம் பருவம்
முதலாம் ஆண்டு
செய்யுள் , பக்தி இலக்கியம், சிற்றிலக்கியம் , இலக்கிய வரலாறு
அலகு : 1. செய்யுள்:

1. திருஞானசம்பந்தர் தேவாரம் - கோளறு பதிகம்

2. திருநாவுக்கரசர் தேவாரம் - தனிக் குறுந்தொகை

3. சுந்தரர் தேவாரம் - திருநொடித் தான் மலை

4. மாணிக்கவாசகர் - திருவாசகம் - தருப்பொன் ஊசல்

அலகு : 2 . செய்யுள்:

5. குலசேகராழ்வார் - பெருமாள் திருமொழி

6. நம்மாழ்வார் திருவாய் மொழி - இரண்டாம் பத்து - உலகிற்கு உபதேசம்

7. ஆண்டாள் - நாச்சியார் திருமொழி - திருமணக்கனவை உரைத்தல்

8. திருமங்கை ஆழ்வார் - சிறிய திருமடல்

அலகு : 3 . செய்யுள்:

9 . திருமூலர் - மூன்றாம் திருமுறை

10 . குமரகுருபரர் - மானாட்சியம்மைப் பிள்ளை - தமிழ் வருகைப் பருவம்

11 . திரிகூடராசப்பக்கவிராயர் - குற்றாலக்குறவஞ்சி - குறத்தி நாட்டு வளங் கூறுதல்

12 . வீரமாமுனிவர் - திருக்காவலூர்க் கலம்பகம்

அலகு : 4 . புதினம்

13 . கு.வெ. பாலசுப்ரமணியன் - காளவாய்

அலகு : 5 . இலக்கிய வரலாறு

14 . சைவ வைணவ இலக்கியங்கள் , சிற்றிலக்கியங்கள் , (பள்ளு - பிள்ளைத்தமிழ் ,- பரணி)

Course Code	Course Title	L	T	P	C

20111AEC21	Advanced English-II	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To know the impact of the biographies of famous people

Outcome:

- Develop technological skill
- Able to write in a variety of formats
- Read biographies and develop personality

UNIT –I

E-mail
Fax
Memos

UNIT – II

Itinerary
Checklist

UNIT – III

Invitation
Circular

UNIT – IV

Instruction
Recommendations

UNIT – V

Biographies of famous people:
Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

Text Book

Author	**Title of the book**	**Edition / Year**	**Publisher**
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Rajendra Pal & J.S.Korlahalli	Business Communication	2015	Sultan

Course Code	**Course Title**	**L**	**T**	**P**	**C**

20111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different forms of literature
- Enhance language skills through literature
- Broaden the horizon of knowledge

UNIT – I

Ecology -A.K. Ramanujan
Gift -Alice Walker
The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans
Asleep -Ernst Jandl
Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle
My Wood - E.M.Forster
The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas
I Have a Dream -Martin Luther king
Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe
The Fortune Teller -Karel Capek
Proposal -Anton Chekov

Text book:

Author	**Title of the book**	**Edition / Year**	**Publisher**
Gowri Sivaraman	Gathered Wisdom	Reprint 2010	Emerald Publishers

Course Code	**Course Title**	**L**	**T**	**P**	**C**

20116AEC23	Microbial Physiology	6	1	0	5

Aim

- To instruct the importance of microbial metabolism and energetics for regulation and application of microbes in industry.

Objectives

- To understand the microbial growth and nutritional requirements.
- Studying the comprehensive awareness on metabolic process involved in prokaryotic and eukaryotic microorganisms.

Outcomes

CO1- To Determining the growth features of the microbes with various environmental factors.
CO2– To Analysis the essential nutrients ensuring microbial growth.

CO3 - To understand the significance of microbial surveillance

CO4- To know the Electron transport and metabolic pathway of living systems

Unit – I

Nutrition and growth of microorganisms: Nutritional types of microorganisms, nutritional requirements. Factors influencing the growth of microorganisms temperature, pH, Osmotic pressure, moisture, radiations and different chemicals. Physiology of growth – significance of various phases of growth - Growth Measurements – batch, continuous and synchronous

Unit – II

Enzymes and co –enzymes: classification and nomenclature of enzymes, active site, Lock and key Machanism 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

Anaerbic – Respiration and fermentations. Anabolic and catabolic processes of lipids - Reproductive physiology of microorganisms.

Text Book:

S. No	Author Name	Title of the Book	Edition/year	Publisher
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5th /1993	Tata McGraw-Hill, Inc, Newyork

Reference Book:

1. Holt J.S., Krieg N.R., Sneath P.H.A and Williams S.T.(1994). Bergey's Menual of Determinative Bacteriology(9th 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

20115AEC24	Bio Chemistry II	6	1	0	4

Aim

- To provide the basic of biochemistry and its application.

Objectives

- It serves as good research techniques and the ability to combine and analyzeinformation.

Outcomes

CO1**-** To Develop a very good understanding of various biomolecules

CO2 **-** To gain knowledge about lipids and fatty acids

CO3**-** To gain knowledge about multifarious function of proteins

CO4- To understand about metabolism.

Unit I

Organization of Life. Water – Physical Properties, Structure of Water, Weak Interactions in aqueous environment; Role of Water in life.

Bioenergetics – Laws of thermodynamics; Free energy concepts; ATP and ADP cycles; ATP as energy currency of cells.

Unit II

Release of energy into cells - Major metabolic pathways – Glycolysis, TCA cycle, Glycogenolysis, Gluconeogenesis, Fatty acid oxidation, ETC and Oxidative phosphorylation.

Unit III

Composition and functions of plant and bacterial cell wall. Biological membrane – Fluid mosaic model; Transport across membranes. Phytohormones – Auxin, Gibberllin and cytokinin.

Unit IV

Cell and cell organelles – Structure and functions of cell organelles – Nucleus, Mitochondria, Chloroplast - Photosynthesis, Golgi apparatus, Endoplasmic reticulum and Micro bodies.

Unit V

Enzymes – Classification, Nomenclature, Mechanism of enzyme action; factors influencing enzyme action – pH and Temperature; Specific activity; MM equation and its significances.

References:

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

20116AEC25L	Microbial Physiology Lab	0	0	3	2

Aim

- To study the nutritional requirement of microbes.

Objectives

- To study the growth patten of bacteria
- To test the biochemical characterization of microbes.

Outcomes

CO1- To Understand and predict the various metabolic reactions in microbial cell.

CO2- To Predict the intermediate products which can be employed in industrial production.

CO3- To know the Environmental growth kinetics of microorganism.

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:
   a. Glucose
   b. Lactose,
   c. Maltose
   d. Sucrose
   e. Mannitol

5. Biochemical test for identification of Bacteria:
   a. Indole test
   b. Methyl red
   c. Voges – Proskaur test
   d. Citrate utilization
   e. TSI agar test
   f. Urease
   g. Catalase
   h. Oxidase

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
20115AEC26L	Bio Chemistry II Lab	0	0	3	2

Aim

- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

- To familiarize the students with the basic cellular processes at molecular level

Outcomes

CO1- To demonstrate an understanding of fundamental biochemical principles

CO2-To learn the structure/function of biomolecules, metabolic pathways, and regulation

CO3**-** Students are able to make buffers, study enzyme kinetics

1. Estimation of reducing sugar by Benedict's Quantitative Method.
2. Estimation of Ascorbic acid by Titrimetric Method.
3. Estimation of Amino Acid by Formal Titration.
4. Estimation of RNA by Orcinol Method.
5. Estimation of DNA by Diphenylamine method.
6. Determination of Acid Number of edible oil.
7. Separation of amino acids by paper chromatography.
8. Separation of amino acids by TLC.
9. Separation of plant pigments by column chromatography.

References:

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer

Course Code	Course Title	L	T	P	C
201ACLSCOS	Communication Skills	-	-	-	**2**

Aim:

Course Objectives :

This course has been developed with the following objectives:

1. Identify common communication problems that may be holding learnersback
2. Identify what their non-verbal messages are communicating toothers
3. Understand role of communication in teaching-learningprocess
4. Learning to communicate through the digitalmedia
5. Understand the importance of empatheticlistening
6. Explore communication beyondlanguage.

Course Outcome :

By the end of this program participants should have a clear understanding of what good communication skills are and what they can do to improve their abilities.

Unit I

- Techniques of effectivelistening
- Listening andcomprehension
- Probing questions
- Barriers tolistening

Unit II

- Pronunciation
- Enunciation
- Vocabulary
- Fluency
- CommonErrors

Unit III

- Techniques of effectivereading
- Gathering ideas and information from a giventext
    i. Identify the main claim of thetext
    ii. Identify the purpose of thetext
    iii. Identify the context of thetext

iv. Identify the conceptsmentioned

- Evaluating these ideas andinformation
  i. Identify the arguments employed in thetext
  ii. Identify the theories employed or assumed in thetext
- Interpret thetext
  i. To understand what a textsays
  ii. To understand what a textdoes
  iii. To understand what a textmeans

Unit IV

- Clearly state theclaims
- Avoid ambiguity, vagueness, unwanted generalisations and over simplification of issues
- Provide backgroundinformation
- Effectively argue theclaim
- Provide evidence for theclaims
- Use examples to explainconcepts
- Followconvention
- Be properlysequenced
- Use proper signpostingtechniques
- Be well structured
  i. Well-knit logicalsequence
  ii. Narrativesequence
  iii. Categorygroupings
- Different modesofWriting -
  i. E-mails
  ii. Proposal writing for HigherStudies
  iii. Recording the proceedings ofmeetings
  iv. Any other mode of writing relevant forlearners

Unit V

- Role of Digital literacy in professionallife
- Trends and opportunities in using digital technology inworkplace
- InternetBasics
- Introduction to MS Officetools
  i. Paint
  ii. Office
  iii. Excel
  iv. Powerpoint

Unit VI

- Introduction to social mediawebsites
- Advantages of socialmedia
- Ethics and etiquettes of socialmedia
- How to use Google searchbetter
- Effective ways of using SocialMedia
- Introduction to DigitalMarketing

Unit VII

- Meaning of non-verbalcommunication
- Introduction to modes of non-verbalcommunication
- Breaking the misbeliefs
- Open and Closed Bodylanguage
- Eye Contact and FacialExpression
- HandGestures
- Do's andDon'ts
- Learning fromexperts
- Activities-BasedLearning

Reference:

1. SenMadhucchanda (2010), *An Introduction to Critical Thinking*, Pearson,Delhi
2. Silvia P. J. (2007), *How to Read a Lot*, American Psychological Association, Washington DC

Course Code	Course Title	L	T	P	C

20110AEC31	Tamil-III	4	0	0	2

தமிழ் மூன்றாம் பருவம்
இரண்டாம் ஆண்டு

செய்யுள் , காப்பியங்கள் இலக்கிய வரலாறு

செய்யுள்

அலகு : 1

1. சிலப்பதிகாரம் - மனையறம் படுத்த காதை
2. மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
3. சீவக சிந்தாமணி - விமலையார் இலம்பகம்

அலகு :2

4. பெரியபுராணம் - இளையான் குடிமாற நாயனார் புராணம்
5. கம்பராமாயணம் - கைகேயி சூழ்வினைப் படலம்

அலகு :3

6. சீறாப்புராணம் - நபி அவதாரப் படலம் - 24 வரிகள்
7. தேம்பாவணி - வாமன் ஆட்சி படலம் - முதல் 5 பாடல்கள்

அலகு :4

8. நளவெண்பா - சுயம்வர காண்டம் (20 - 51)

அலகு . 5 : இலக்கிய வரலாறு

9. காப்பியங்கள் , ஐஞ்சிறு காப்பியங்கள் , புராணங்கள் , இதிகாசங்கள்

Course Code	Course Title	L	T	P	C

20111AEC31	Advanced English-III	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand phonetics
- Develop writing skill
- Able to develop creative writing

UNIT –I

The organs of speech
Classification of speech sounds
Vowels and Diphthongs

UNIT –II

Consonants
Consonant cluster

UNIT – III

Syllable
Word accent
Intonation

UNIT – IV

Idiom
Interpretation of graphics

UNIT – V

Slogan writing
Writing advertisement

Reference books:

Author	**Title of the book**	**Edition / Year**	**Publisher**
T.B. Balasubramaniyan	A text book of Phonetics for Indian Students	Reprint 2008	Macmillian
Meenakshi Sharma & Sangeetha Sharma	Technical Communication	2011	Oxford University Press

Course Code	Course Title	L	T	P	C
20111AEC32	English-III	4	0	0	2

Aim:

- To acquaint with learning English through literature

Objective:

- To sensitize language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Appreciate different types of prose
- Develop the conversational skills through one act plays
- Enhance the skill of making grammatically correct sentences.

UNIT – 1

The Doctor's World - R.K. Narayan
The Postmaster - Rabindranath Tagore
Princess September - E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay
The Open Window -Saki
The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke
Uneasy Home Coming - Will F. Jenkins
Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton
The Princess and the Wood Cutter -Alan Alexander Milne

Text book:

Author	Title of the book	Edition / Year	Publisher
Steuart H.King	Nine Short Stories	Reprint 2001	Blackie Books
T.Prabhakar	One – Act Play		Emerald

Course Code	Course Title	L	T	P	C

20116AEC33	Immunology	4	1	0	4

Aim:

- Intended to impart the basic and essential information on immune system.

Objectives

- This course focuses on the concepts of immune system in human body.
- To create awareness on immunity
- To give knowledge on antigen and antibody
- To learn human diseases and vaccine

Outcomes

CO1- To understand theory linked to cells and organs related to immune system.

CO2- Able to know Immune response and immune mechanism.

CO3- To Understand the mechanism of Immunological disorders.

CO4- To Learn the importance and precautions of Immunodeficiency syndromes

Unit I

Introduction- History of immunology-scope of immunology. Immunity and their types- Innate and Acquired immunity, Active and Passive immunity. Immune response- Humoral and Cell mediated immune response.

Unit II

Lymphoid organs- primary and secondary lymphoid organs and their role. Cells of the immune system – Stem cell, Lymphocytes, T and B lymphocytes. Plasma cell, T Helper cell, T suppressor cell, T-cytotoxic cell, Null cells, Killer cell, Macrophages, Blood cells and platelets.

Unit III

Antigen- types, chemical nature and essential factors of antigen, Hapten, Adjuvants, Immunoglobulin - Structure, classes, properties and functions. Antigen- antibody reactions.

Unit IV

Complement- Salient features, complement activation, Classical pathway, Alternative pathway, Biological function of complement system. Major Histocompatability complex (MHC)- Types and functions.

Unit V

Monoclonal antibodies, Hypersensitivity reactions, Immunoprophylaxis, Vaccines – types, Toxoid and antitoxin, Immunoelectrophoresis, HLA typing, ELISA and RIA

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	Kuby	Immunology	4^{th} / 2000	W.H. Frumen and Company

Reference Book:

1. Abul. K. Abbas, Andrew H.Lichtman, Jordan S.Pobar 1994. Cellular and Molecular Immunology. II edition. W.B.Saunders, U.S.A.
2. William E.Paul 1993. Fundamental Immunology. II edition, Raven press, New York.
3. Topley & Wilson's 1990. Principles of Bacteriology, Virology and Immunity VIII edition Vol.I General Microbiology and Immunity. Edward Arnold, London.
4. Lesile Hudson, Frank C.Hay, 1989. III edition. Practical Immunology. Blackwell Scientific Publication.
5. Helen Chapel, Mansel Haeney. 1986. Essentials of clinical Immunology . ELBS.
6. Mackett M. and Wiliamson J.D.1995. Human vaccines and vaccination. BIOS Scientific Publishers.
7. Bernard R.Glick and Jack J.Pasternak 1994. Molecular Biotechnology – Principles and Applications of Recombinant DNA. ASM Press, Washington.

Course Code	Course Title	L	T	P	C
20116AEC34	Cell Biology	4	1	0	5

Aim:

- Students will understand the cellular basis of life and their importance.

Objectives:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells

Outcomes:

- To grasp the significance of cell and its components in living systems
- To understand the and describe the structures and basic components of prokaryotic and eukaryotic cells
- To understand the cyclical events of cell division and types of cell division
- To acquire the knowledge of cell biology for understanding various physiological process
- To understand the synthesis of cellular compounds and cell signaling

Unit - I

History of cell biology, cell as basic unit of life, cell theory, protoplasm theory and organismal theory, broad classification of cell types, Bacteria, Archaea (prokaryotic) and eukaryotic cells and their similarities and differences.

Unit - II

Cell Organelles- Nucleus, Endoplasmic Reticulum(link is external), Golgi Apparatus, Mitochondria(link is external), Chloroplast(link is external), Lysosome, Peroxisome – Protein Sorting & Transport – Cytoskeleton(link is external) & Cell Movement – The Plasma Membrane

Unit - III

Biogenesis of Cellular organelles – Biosynthesis of mitochondria, chloroplast, ER, Golgi complex; Biosynthetic process in ER and golgi apparatus; Protein synthesis and folding in the cytoplasm; Degradation of cellular components.

Unit - IV

Cell cycle - An overview of cell cycle; Components of cell cycle control system; Intracellular and Extra-cellular control of cell division, Programmed cell death

(Apoptosis), intrinsic & extrinsic pathways of cell death, Apoptosis in relation with Cancer and Viral disease

Unit - V

Cell communication – overview – types of cell signaling – signal molecules – signal amplification – receptor types – quorum sensing.

REFERENCES

- Verma P.S. and Agarwal V.K. (2016) Cell Biology (Cytology, Biomolecules,Molecular Biology), Paperback, S. Chand and Company Ltd.

- Molecular Biology of the Cell by Bruce Alberts, Alexander Johnson, Julian Lewis, David Morgan, Martin Raff, Keith Roberts, Peter Walter, 6th Edn, 2015, Garland Science

- The Cell, A Molecular Approach(link is external) – 6th Edition – Geoffrey M.Cooper/Robert E.Hausman- Sinauer Associates, Inc.

- KumarP. and Mina U. (2014) Life Sciences: Fundamentals and Practice, Part-I, 4thEdn. Pathfinder Publication. p.582.

Course Code	Course Title	L	T	P	C
20116AEC35L	Immunology Lab	0	0	3	2

Aim

- To learn the immunological techniques in disease diagnosis.

Objectives

- Acquire knowledge on antigen antibody reactions.
- Styding the immunology tests and their interpretations.

Outcomes

CO1- Able to know about principles and techniques Blood grouping
CO2- To Understand the immunological experiments for clinical field
CO3- To know the methods of Counting of RBC, WBC and platelets

Lab work

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

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

20116AEC36L	Cell Biology Lab	0	0	3	2

Aim:

- Students will understand the cellular basis of life and their importance.

Objectives:

- Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles
- Students will understand how these cellular components are used to generate and utilize energy in cells

Outcomes:

To grasp the significance of cell and its components in living systems

- To understand the and describe the structures and basic components of prokaryotic and eukaryotic cells
- To understand the cyclical events of cell division and types of cell division

1. Separation of nucleic acid bases by paper chromatography
2. Mitosis in onion root
3. Meiosis in flower bud
4. Normal human karyotyping
5. preparation of polytene chromosome
6. Isolation of chloroplast from spinach leaves
7. Isolation of protoplast
8. Life cycle of Drosophila
9. Culture of Human, Plant & Animal cells
10. Identification and study of cancer cells- Slides/Photomicrographs

REFERENCE:

- Experimental procedures in Life Sciences, S.Rajan and R. Selvi Christy, 2010, Anjanaa book house.
- Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. VI Edition. John Wiley & Sons. Inc.

Course Code	Course Title	L	T	P	C

20116RMC37	Research Methodology	2	0	0	2

Aim:

To create a basic appreciation towards research process and awareness of various research publication

Objectives:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

Outcomes:

CO1- To Understand research questions and tools

CO2- To gain Experience in scientific writings

CO3- To Practice in various aspects of scientific publications

CO4- To understand Inculcation of research ethics

Prerequesties:

Basic computer literacy & skills for working in window-environment

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V:

Basic Principles of Laboratory Safety and Waste management

Introduction - Access to Laboratory and Emergency Exits - Personal Protective Clothing and Equipment - Good Working Practices-Maintenance of Laboratory Equipment - Working with Hazardous Substances - Storage of Chemicals - Working with Flammable Solvents - Gas Cylinders-Fire Precautions - Emergency Procedures - First Aid - Accident Follow-Up - Safety Manual - Safety Training - Management of Laboratory Safety and Responsibilities - Waste Management.

Course Code	Course Title	L	T	P	C
201ACLSOAN	OFFICE AUTOMATION	-	-	-	2

Aim:

Course Objectives :

To provide an in-depth training in use of office automation, internet and internet tools. The course also helps the candidates to get acquainted with IT.

Course Outcomes:

After completion of the course, students would be able to documents, spreadsheets, make small presentations and would be acquainted with internet.

UNIT I

Knowing the basics of Computers

UNIT II

Word Processing (MS word)

UNIT III

Spread Sheet (MS XL)

UNIT IV

Presentation (MS Power Point)

UNIT V

Communicating with Internet

Reference:

1. Fundamentals of computers - V.Rajaraman - Prentice- Hall of india
2. Microsoft Office 2007 Bible - John Walkenbach,Herb Tyson,Faithe Wempen,cary N.Prague,Michael R.groh,Peter G.Aitken, and Lisa a.Bucki -Wiley India pvt.ltd.
3. Introduction to Information Technology - Alexis Leon, Mathews Leon, and Leena Leon, Vijay Nicole Imprints Pvt. Ltd., 2013.
4. Computer Fundamentals - P. K. Sinha Publisher: BPB Publications
5. https://en.wikipedia.org
6. https://wiki.openoffice.org/wiki/Documentation
7. http://windows.microsoft.com/en-in/windows/windows-basics-all-topics

Course Code	Course Title	L	T	P	C
20110AEC41	Tamil-IV	4	0	0	2

தமிழ்.

நான்காம் பருவம்

இரண்டாம் ஆண்டு

செய்யுள் , சங்க இலக்கியம், அற இலக்கியம் , செம்மொழி , இலக்கிய வரலாறு

அலகு . 1 : பண்டைய இலக்கியம் - நற்றிணை;

1. நெய்தல் - தோழி கூற்று - பாடல் எண் . 11

2. குறிஞ்சி - தலைவி கூற்று - பாடல் எண். 64

3. முல்லை - தலைவன் கூற்று - பாடல் எண்.142

4. பாலை - நற்றாய் கூற்று - பாடல் எண். 29

5. மருதம் - தலைவி கூற்று - பாடல் எண். 70

பண்டைய இலக்கியம் குறுந்தொகை

1 . குறிஞ்சி - தோழி கூற்று - பாடல் எண்.1

2. முல்லை - செவிலித்தாய் கூற்று - பாடல் எண்.167

3. மருதம் - தலைவி கூற்று - பாடல் எண். 181

4. நெய்தல் - தலைவி கூற்று - பாடல் எண் . 290

5. பாலை - தலைவன் கூற்று - பாடல் எண் . 347

பண்டைய இலக்கியம் ஐங்குறுநூறு

1. மருதம் - கள்வன் பத்து - முதல் இரண்டு பாடல்கள்

2. நெய்தல் - தோழிக்குரைத்த பத்து - முதல் இரண்டு பாடல்கள்

3. குறிஞ்சி - குன்றக் குறவன் பத்து - முதல் இரண்டு பாடல்கள்

4. பாலை - இளவேனிற் பத்து - முதல் இரண்டு பாடல்கள்

5. முல்லை - பாசறைப் பத்து - முதல் இரண்டு பாடல்கள்

அலகு . 2 : கலிந்தொகை

1 . பாலை - பாடல் எண். 2

2. குறிஞ்சி - பாடல் எண். 37

அகநானூறு

1 . பாலை - பாடல் எண். 5

2. மருதம் - பாடல் எண். 6

புறநானூறு

பாடல் எண் : 6 ,121, 41, 153 ,172 191, 223, 246, 284, 358.

பதிற்றுப்பத்து

இரண்டாம் பத்து பாடல் எண். 4 (நிலம் நீர் வளி விசும்பு)

அலகு.3;

1 . பட்டினப்பாலை - முதல் 105 வரிகள்

2. திருக்குறள் - 1.மருந்து 2.ஊக்கமுடைமை 3.உழவு

அலகு . 4 : செம்மொழி வரனறு ;

(மொழி - விளக்கம் , மொழிக்குடும்பங்கள், உலகச் செம்மொழிகள், இந்தியச் செம்மொழிகள் , செம்மொழித் தகுதிகள் , வரையறைகள், வாழும் தமிழ் செம்மொழி, தொன்மை , தமிழின் சிறப்புகள், தமிழ் செம்மொழி நூல்கள்)

அலகு . 5 : இலக்கிய வரலாறு

சங்க இலக்கியங்கள் , பதினெண்கீழ்க்கணக்கு நூல்கள்.

Course Code	Course Title	L	T	P	C
20111AEC41	Advanced English-IV	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:

- Develop writing skill
- Comprehend and describe poems
- Learn interviewing skills

UNIT –I

Interviews

Objectives, types, ten success factors, ten failure factors - Planning and preparation –Presentation– Type of questions – Answering techniques.

UNIT – II

Flowchart

Proposals

UNIT – III

Discourse markers

Review

UNIT IV

Grammatical forms

Paraphrasing

UNIT –V

Definition

Writing for and against a topic.

Reference books:

Author	Title of the book	Edition / Year	Publisher
Rajendra Pal & J.S Korlahalli	Essentials of Business Communication	2015	Sultan Chand & Sons
Meenakshi Raman & Sangeetha Sharma	Technical Communication	2011	Oxford University Press
Wren & Martin	English Grammar & Composition	2009	S.Chand

Course Code	Course Title	L	T	P	C
20111AEC42	English-IV	4	0	0	2

Aim:
- To learn English through literature

Objective:
- To explore learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:
- Improve their ability to read and understand
- Know the genius of Shakespeare
- Express one's views in writing

UNIT –I
My Last Duchess -Robert Browning
The Toys -Coventry Patmore
I, too -Langston Hughes
UNIT –II
How to be a Doctor -Stephen Leacock
My Visions for India -A.P.J. Abdul Kalam
Woman, not the weaker sex -M.K. Gandhi
UNIT –III
The Best Investment I ever made-A.J.Cronin
The Verger -W.S Maugham
A Willing Slave -R.K.Narayan
UNIT –IV
Macbeth
As You Like It
UNIT –V
Henry IV
Tempest

Text book:

Author	Title of the book	Edition / Year	Publisher
Devaraj	English for Enrichment		Emerald Publishers
Board of Editors	Selected Scenes from Shakespeare Book I & II	2012	Emerald Publishers

Course Code	Course Title	L	T	P	C
20116AEC43	Virology	4	1	0	4

Aim:

- To study the characteristics of viruses and viral infections.

Objectives

- To study general aspects of classification and structure of viruses.
- Studyin the viral infections, their diagnosis and treatment strategies.

Outcomes

CO1**-** To Understand the characteristic features of viruses.

CO2– To Gain the knowledge about the biology of bacteriophages.

CO3– To Learn therange of plant viruses and animal viruses.

CO4 **-**To know the role of viruses in causing of cancer

UNIT – I

Introduction – Definition, History of virology. General properties of Viruses classification of Viruses – cultivation of Viruses – Structure and replications Viruses.

UNIT – II

Bacterial Viruses – structure of bacteriophage, The Lytic life cycle (T-Even coliphages) – Lysogenic life cycle (*Escherchia coli*, Phage Lambda) noninteractive lysogeny (*Escheirchia coli*).

UNIT – III

Plant Viruses, Common plant viral diseases: Tobacco Mosaic **Virus** (TMV), Bunchy top of banana, satellite virus. Cucumber Mosaic **Virus** (CMV), Cauliflower Mosaic **Virus** (CaMV). Bacteriophages, Viroids.

UNIT – IV

Animal viruses: Morphology, pathogenesis and laboratory diagnosis of Prions, Animal viruses Rinder pest, Blue tongue, Raniket dion, Foot and Mouth Disease. Human Viruses – Herpes, HIV, Hepatitis Viruses. Viral Vaccines. Prevention and treatment of viral diseases. Antiviral agents.

UNIT - V

Virus: Assay, purification and characterization of Viruses, Separation and characterization of viral components and quantification of Viruses. Immune responses to viruses, Interferon and other cytokines, Antiviral therapy.

Text books:

S. No	Author Name	Title of the Book	Edition/year	Publisher
1	Nester, E.W, D.G. Anderson, C. Erans Roberts, N.N. Pearsan, M.T. Nester	Introduction Microbiology	4th / 2004	Mc Graw Hill Hyher Education
1.	R. C. Dubey, D.K. Maheswari	A Text Book of Microbiology	3rd / 2003	Chand Publishing

Reference Book:

1. Conrat, H.F.Kimball, P.C. and Levy, J.A.(1988). Virology. II Edition. Prentice Hall, Englewood cliff, New Jersey.
2. Harold J.Benson. 1994. Microbiological Applications. Wm.C.Brown Publishers, Melbourne, Austrialia.
3. James, C.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub. Co. Calfornia.

Course Code	Course Title	L	T	P	C

20116AEC44	Biostatistics and Bioinformatics	5	1	0	5

Aim

- To introduce the basic knowledge on Biostatistics and Bioinformatics tools and its applications

Objective

- The basic objective is to give students an introduction to the biostatistics and bioinformatics.
- Emphasis will be given to the application of biostatistics, bioinformatics and biological databases to problem solving in real research problems.

Outcome

- To understand the importance of principal concepts about biostatistics
- To know the knowledge about statistics and its relation with other science and research aspects
- To obtain the knowledge on bioinformatics databases, perform text- and sequence-based searches
- To become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems.

Unit I

Concepts in statistics, Types of Data, presentation of data, types of graphics, relative frequency, cumulative frequency, Measurement of central tendency, Measures of variation, coefficient of variation, Measures of Skewness and Kurtosis, Probability and its applications, Laws of Addition and Multiplication, Compound probability, Baye's Theorem.

Unit II

Random Variables and Distributions. Binomial, Poisson, Exponential and Normal Distributions and their applications. Samples and Sampling Distribution, Standard Error, significance level, Degrees of freedom, Tests of significance, tests for proportion, t and F tests Confidence. Correlation: Simple, Partial and Multiple Correlation. Regression Analysis. Analysis of variance for one and two way classification

UNIT III

Biological Databases: Structure, Sequence and literature databases. Protein sequence database - PIR, SWISS-PROT, MIPS. Protein structure database - PDB, SCOP. DNA sequence databases – Gen Bank, ENBL, MBL, DDBJ. Literature data base – Med Line, PubMed. Patterns, motifs and profile Databases: Metabolic Pathway Databases.

UNIT IV

Sequence Alignment and Analysis: Local and Global alignment. Scoring matrices. Database Similarity Searches: BLAST, FASTA, PSI-BLAST algorithms; Pair wise sequence alignment - NEEDLEMAN and Wunsch, Smith Waterman algorithms; Multiple sequence alignments - CLUSTAL, PRAS; Patterns, motifs and Profiles in sequences.

UNIT V

Important parameters in Drug Discovery and the role of computational methods. Process of drug discovery – Target identification, target validation, lead identification, lead optimization and preclinical pharmacology and toxicology. Computer Aided Drug Design (CADD). Molecular docking - Concept of receptor and target. Receptor binding and activation. Ligand-receptor interaction, non-covalent bonds. Ligand into the binding site.

References

Andreas D. Baxevanis And B. F. Francis Ouellette. 2001. **Bioinformatics.**A Practical Guide to the Analysis of Genes and Proteins (Second Edition). John Wiley & Sons, Inc.

Arthur M. LESK, 2003 Introduction to Bioinformatics Oxford University Press

Attwood T. K. And Parry-Smith D. J. 2003. Introduction to Bioinformatics. Pearson Education (Singapore) Pvt. Ltd.

Balasubramanian, D., Bryce, C. F. A., Dharmalingam, K., Green, J. And Kunthala Jayaraman. 1996. Concepts in Biotechnology (Edts.) University Press (India) Ltd.

Basu, O., S.K. Thukral. 2007. Bioinformatics-Databases, Tools and Algorithms. Oxford University Press, New Delhi.

Bryan Bergeron, M.D. 2006. Bioinformatics Computing. 2006. Prentice Hall of India Pvt Limited, New Delhi.

Gautham, N. 2006. Bioinformatics- Databases and Algorithms, Narosa Publishing House Hall of India Pvt. Ltd, New Delhi.

Ignacimuthu, S.S.J. 2005. Basic Bioinformatics, Narosa Publishing House, India.

Lesk, A.M. 2006. Introduction to Bioinformatics. (2nd Edition). Oxford University Press, New Delhi.

Course Code	Course Title	L	T	P	C
201ENSTU45	Environmental studies	2	0	0	2

Objectives:

- Creating the awareness about environmental problems among people.
- Imparting basic knowledge about the environment and its allied problems.
- Developing an attitude of concern for the environment.
- Motivating public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

Outcome

CO1- To Understand eco-system

CO2- To Know social issues and the environment

CO3- To Learn keep the environment eco-friendly

1. Nature of Environmental Studies

Definition, scope and importance.
Multidisciplinary nature of environmental studies
Need for public awareness.

2. Natural Resources and Associated Problems.

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 *I* lad Listrial / Agricultural.

or

Study of common plants, insects, birds.

or

Study of simple ecosystems -— ponds, river, hill slopes, etc.

References:

1) Agarwal, K.C,200l, Environmental Biology, Nidi Pub. Ltd., Bikaner.

2) Bharucha Erach, The l3iodiversity of India, Mapin Publishing Pvt, Ltd., Ahmedabad 380013, India, Email: rn4pin@icenet.net (R)

3) Brunner R.C., 1989, 1-lazardous Waste Incineration, McGraw Hill Inc. 480p

4) Clank R.S., Marine Pollution, Clanderson Press Oxford (TB)

5) Cunningham, W.P. Cooper, T.H. Gorhani, E. & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Pub. Mumbai, Il96p

6) De A.K., Environmental Chemistry, Wiley Wastern 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 Dcv., 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 PubI. Hkouse, Meerut

17) Survey of the Environment, The Hindu (M)

18) Townsend C., Harper, J, and Michael Begon, Essentials of Ecology, Blackwell Science (TB)

19) Trivedi R.K. Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, vol. 1 and II, Environmental Media (R)

20) Trivedi R.K. and P.K. Goel, Introduction to air pollution, Techno— Science Publications (TB)
21)Wagner K.D., 1998, Environmental management, W.B. Saunders Co. Philadelphia, USA 499p,
22) Paryavaran shastra — Gholap T.N,
23) Paryavaran Sahastra — Gharapure
(M) Magazine
(R) Reference
(TB) Textbook

Learning Outcomes:

Students who graduate with a major in environmental science will be able to:

1. Understand the principles of ecology and environmental issues that apply to air, land, and water issues on a global scale;
2. Develop critical thinking and/or observation skills, and apply them to the analysis of a problem or question related to the environment;
3. Demonstrate ecology knowledge of a complex relationship between predators, prey, and the plant community;
4. Apply their ecological knowledge to illustrate and graph a problem and
5. describe the realities that managers face when dealing with complex issues; and
6. Understand how politics and management have ecological consequences.

Course Code	Course Title	L	T	P	C
20116AEC46L	Virology Lab	0	0	3	2

Aim:

- To study the isolation and cultivation methods for viruses.

Objectives

- Cultivation of viruses and various methods of propagation.

Outcomes

CO1- To Know the structure of plants, animal, bacteria and viruses.
CO2- To grasp the significance of isolation, propagation of various viruses

CO3- To build clinical laboratory testing devices

Lab work

1. Isolation of coliphage from sewage.

2. Determining Bacteriophage Titers

3. Cultivation of viruses in embryonated egg.

4. Chicks Embryo Fibroblast technique for virus cultivation

Demonstrations

1. Isolation of microorganisms from Phyllosphere.
2. Study of the following viral diseases: Tobacco mosaic; Cucumber Mosaic Virus.
3. Demonstrations of some plant, animal & human viruses (photographs, diagram etc.).

Course Code	Course Title	L	T	P	C
20116AEC47L	Biostatistics and Bioinformatics Lab	0	0	3	2

Aim

- To introduce the basic knowledge on Biostatistics and Bioinformatics tools and its applications

Objective

- The basic objective is to give students an introduction to the biostatistics and bioinformatics.
- Emphasis will be given to the application of biostatistics, bioinformatics and biological databases to problem solving in real research problems.

Outcomes

CO1: To Read and learn statistical measures individually.

CO2- To analysis the data from experiments and interpretation of the *results*

CO3- To study the multivariate analysis in biostatistics

CO4 - To understand the nucleotide sequence data of the given species using NCBI / EMBL / DDBJ.

CO5 - To identify the protein sequence of the species using PIR and Swissprot / UniProt

1. Mean and Standard deviation using biological samples
2. Chi – Square test, Student 't' test and Correlation coefficient
3. Regression Coefficient and regression lines
4. Pairwise alignment using FASTA, BLAST.
5. Multiple alignments using Clustal W.
6. Study of internet resources in Bioinformatics – NCBI, ENBL, EBI.

Course Code	Course Title	L	T	P	C
201ACLSLMS	Leadership and Management Skills	-	-	-	2

Aim:

The aim of the course cultivating and nurturing the innate leadership skills of the youth so that they may transform these challenges into opportunities and become torch bearers of the future by developing creative solutions.

Course Objective:

The Module is designed to**:**

- Help students to develop essential skills to influence and motivate others
- Inculcate emotional and social intelligence and integrative thinking for effective leadership
- Create and maintain an effective and motivated team to work for the society
- Nurture a creative and entrepreneurial mindset
- Make students understand the personal values and apply ethical principles in professional
  and social contexts.

Course Outcomes :

Upon completion of the course students will be able to:

1. Examine various leadership models and understand/assess their skills, strengths and
   abilities that affect their own leadership style and can create their leadership vision
2. Learn and demonstrate a set of practical skills such as time management, self management,
   handling conflicts, team leadership, etc.
3. Understand the basics of entrepreneurship and develop business plans
4. Apply the design thinking approach for leadership
5. Appreciate the importance of ethics and moral values for making of a balanced personality.

UNIT I- Leadership Skills

a. Understanding Leadership and its Importance

- What is leadership?
- Why Leadership required?
- Whom do you consider as an ideal leader?

b. Traits and Models of Leadership

- Are leaders born or made?
- Key characteristics of an effective leader
- Leadership styles
- Perspectives of different leaders

c. Basic Leadership Skills

- Motivation
- Team work
- Negotiation
- Networking

UNIT II - Managerial Skills

a. Basic Managerial Skills

- Planning for effective management
- How to organise teams?
- Recruiting and retaining talent
- Delegation of tasks
- Learn to coordinate
- Conflict management

b. Self Management Skills

- Understanding self concept
- Developing self-awareness
- Self-examination
- Self-regulation

UNIT III - Entrepreneurial Skills

a. Basics of Entrepreneurship

- Meaning of entrepreneurship
- Classification and types of entrepreneurship
- Traits and competencies of entrepreneur

b. Creating Business Plan

- Problem identification and idea generation
- Idea validation
- Pitch making

UNIT IV - Innovative Leadership and Design Thinking

a. Innovative Leadership

- Concept of emotional and social intelligence
- Synthesis of human and artificial intelligence
- Why does culture matter for today's global leaders

b. Design Thinking

- What is design thinking?
- Key elements of design thinking:
  - Discovery
  - Interpretation
  - Ideation
  - Experimentation
  - Evolution.
- How to transform challenges into opportunities?
- How to develop human-centric solutions for creating social good?

UNIT V- Ethics and Integrity

a. Learning through Biographies

- What makes an individual great?
- Understanding the persona of a leader for deriving holistic inspiration
- Drawing insights for leadership
- How leaders sail through difficult situations?

b. Ethics and Conduct

- Importance of ethics
- Ethical decision making
- Personal and professional moral codes of conduct
- Creating a harmonious life

Bibliography and Suggested Readings :

Books

- Ashokan, M. S. (2015). *Karmayogi: A Bbiography of E. Sreedharan*. Penguin, UK.
- Brown, T. (2012). *Change by Design.* Harper Business
- Elkington, J., & Hartigan, P. (2008). *The Power of Unreasonable People: How Social Entrepreneurs Create Markets that Change the World*. Harvard Business Press.
- Goleman D. (1995). *Emotional Intelligence*. Bloomsbury Publishing India Private Limited
- Kalam A. A. (2003). *Ignited Minds: Unleashing the Power within India*. Penguin Books India
- Kelly T., Kelly D. (2014). *Creative Confidence: Unleashing the Creative*

Potential Within Us All. William Collins

- Kurien V., & Salve G. (2012). *I Too Had a Dream*. Roli Books Private Limited
- Livermore D. A. (2010). *Leading with cultural intelligence: The New Secret to Success*. New York: American Management Association
- McCormack M. H. (1986). *What They Don't Teach You at Harvard Business School: Notes From A Street-Smart Executive*. RHUS
- O'Toole J. (2019) *The Enlightened Capitalists: Cautionary Tales of Business Pioneers Who Tried to Do Well by Doing Good.* Harpercollins
- Sinek S. (2009). *Start with Why: How Great Leaders Inspire Everyone to Take Action*. Penguin
- Sternberg R. J., Sternberg R. J., & Baltes P. B. (Eds.). (2004). *International Handbook of Intelligence*. Cambridge University Press.

E-Resources

- Fries, K. (2019). 8 Essential Qualities That Define Great Leadership. *Forbes*. Retrieved 2019- 02-15 from https://www.forbes.com/sites/kimberlyfries/2018/02/08/8-essential-qualities-that-define-great-leadership/#452ecc963b63.
- How to Build Your Creative Confidence, Ted Talk by David Kelly - https://www.ted. com/talks/david_kelley_how_to_build_your_creative_confidence
- India's Hidden Hot Beds of Invention Ted Talk by Anil Gupta - https://www.ted.com/ talks/anil_gupta_india_s_hidden_hotbeds_of_invention
- Knowledge@Wharton Interviews Former Indian President APJ Abdul Kalam - . "A Leader Should Know How to Manage Failure" https://www.youtube.com/ watch?v=laGZaS4sdeU
- Martin, R. (2007). How Successful Leaders Think. *Harvard Business Review*, *85*(6): 60.
- NPTEL Course on Leadership - https://nptel.ac.in/courses/122105021/9

Course Code	Course Title	L	T	P	C
20116AEC51	Food and Dairy Microbiology	4	1	0	4

Aim:

- To learn the role of microbes in food production, food spoilage and food borne illness.

Objectives

- To learn about factors involed in microbial food spoilage
- Understanding the food preservation methods
- To make aware of food borne diseases

Outcomes

CO1– To identify the role of microorganisms in the production of food

CO2– To know the milk and foods quality test for detecting microorganisms

CO3– To Gain the knowledge regarding food preservation

UNIT – I

Introduction: Importance of food and dairy Microbiology – Types of microorganisms in food – Source of contamination (primary sources) – Factors influencing microbial growth in foods (extrinsic and intrinsic).

UNIT – II

Food fermentations: Cheese, bread, wine, fermented vegetables – methods and organisms used. Food and enzymes from microorganisms – single cell protein, production of enzymes.

UNIT – III

Contamination, spoilage and preservation of different kinds of foods, cereals and cereal products – sugar and sugar products – vegetable and fruits – meat and meat products – fish and other sea foods – eggs and poultry – dairy and fermentative products (ice cream/milk/bread/wine).

UNIT – IV

Food Poisoning: food borne infections (a) Bacterial: *Staphylococcal, Brucella, Bacillus*, *Clostridium, Escherichia*, *Salmonella* (b) Fungal: Mycotoxins including aflatoxins, (c) Viral: Hepatitis, (d) Protozoa – Amoebiasis.

UNIT – V

Food preservation: Principles of food preservation – methods of preservation. a. Physical (irradiation, drying, heat processing, chilling and freezing, high pressure and modification of atmosphere) b. Chemical (Sodium benzoate Class I & II). Food Sanitation: Good manufacturing practices – Hazard analysis, Critical control points, Personnel hygiene.

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	W.C. Frazier, D.C. Westhoff	Food Microbiology	4^{th} /1988	TATA McGraw Hill Publishing company ltd

Reference Book:

1. Banwart, G.J.1989. Basic Food Microbiology, Chapman & Hall New York.
2. Board, R.C.1983. A Modern Introduction to Food Microbiology, Blackwell Scientific Publications, Oxford.
3. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.
4. Hobbs, B.C. and Roberts, D.1993. Food Poisiong and Food Hygiene, Edward Arnold (A division of Hodder and Stoughton), London.

Course Code	Course Title	L	T	P	C
20116AEC52	Molecular Biology	4	1	0	3

UNIT – I

Historical and conceptual background - Discovery of DNA as genetic material, Griffith's experiment, Hershy and Chase warring blender experiment, Chargaff's rule. Structures of DNA and RNA: Types of genetic material. DNA Structure: Salient features of double helix, types of DNA. RNA Structure. Denaturation and renaturation, cot curves. DNA topology: linking number, topoisomerases. DNA organization in prokaryotes, viruses, eukaryotes

UNIT – II

DNA replication in prokaryotes: Replicons – models of DNA replication – origin and termination of replication – rolling circle replication – proof for semi conservative replication (Meselson and Stahl Experiment) – enzymes and proteins involved in DNA replication (nucleases, polymerases, ligases, helicases, gyrases, single strand binding protein, replisome and primosome) – mechanism of semi discontinuous replication.

UNIT – III

Transcription: Steps involved in transcription of prokaryotes, promoters, transcription factors, RNA polymerases I, II and III – ribosomal RNA transcription and processing – genetic code, deciphering the genetic code, characteristics of genetic code, Wobble hypothesis, central dogma of life and reversal of central dogma.

UNIT – IV

Translation: Steps involved in translation of prokaryotes – role of proteasomes in protein degradation – mechanism of action of antibiotics on protein synthesis (puromycin, chloramphenicol and streptomycin). Regulation of gene expression in prokaryotes – polycistronic mRNA and operons (lac operon and trp operon and attenuation mechanism).

UNIT – V

Mutation: spontaneous and induced mutations – UV and X - rays – mechanism of action of base analogues, alkylating agents, intercalating agents and teratogens – reversion suppressor mutations and mutation rate – repair of damaged DNA - excision repair, SOS, photoreactivation – CRISPR and their role in genome stability

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	U. Sathyanarayana	Biotechnology	2010	Arunabha Sen Books and Allied (P)Ltd
2	Dr. P. Asokan	Molecular Biology	2006	Chinnaa Publications
3	U. Sathyanarayana	Biotechnology	2010	Arunabha Sen Books and Allied (P)Ltd

References

1. Maloy SR, Cronan Jr.JE, Freifelder D.1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1992 Nucleic acids and Molecular Biology – Springer – Verlag.
3. Blackburn CM, Gait MJ. 1996. Nucleic acids in Chemistry and Biology – Oxford University Press.
4. Stryer L.1995. Biochemistry. W.H.Freeman and company.
5. Eckstein F, Lilley DM.1996 Catalytic RNA – Springer – Verlag.
6. Frieldberg EC, Walker GC, Siede W.1995. DNA repair and Mutagenesis. ASM press.
7. Gardner EJ, Simmons MJ, Snustad DP, 1991. Principles of Genetics. John Wiley & Sons.
8. Singer M, Berg P.1991. Genes and Genomes. University Science Books.

Course Code	Course Title	L	T	P	C
20116AEC53	Agricultural and Environmental Microbiology	4	1	0	4

Aim:

- To learn about microorganisms in the environment and their importance in agriculture.

Objectives

- To know the microbes in various environments like soil, water and air.
- Importance of microbes in agricultute and waste treatment.

Outcome

CO1 - To acquire the information about microbes

CO2 - To Know about microbes and its role in environment.

CO3 - Able to understand about microbes in agriculture and environmental practice.

UNIT – I

Classification of soils. Physical and chemical characteristics and microflora of various soil types. Interactions among microorganisms: Symbiosis – mutualism – commensalisms – competition – amensalism – synergism – parasitism – predation. Biogeochemical cycles. Carbon, nitrogen, phosphorus and sulphur.

UNIT – II

Biofertilizers. Symbiotic nitrogen fixation – (*Rhizobium, Frankia*) –Symbiotic nutrient mobilizers – Endomycorrhizae and Ectomycorrizae – 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, saltt pans, coral reefs. Zonations – upwelling – eutrophication – food chain. Potability of water – microbial assessment of water quality – water purification – brief account of water - borne diseases.

UNIT – V

Types of wastes – characterization of solid and liquid wastes. Solid waste treatment – saccharification – gasification – composting, Utilization of solid wastes – food (SCP, mushroom, yeast); fuel (ethanol, methane, hydrogen); fertilizers (composting). Liquid waste treatment. Treatment methods – primary –secondary (anaerobic – methanogenesis; aerobic- trickling activated sludge – oxidation pond – tertiary treatment.

Text Books

S. No	Author Name	Title of the Book	Edition/year	Publisher
1.	K.C. Agarwal	Environmental Biology	1998	Agro Botanica
2.	P. Rajendran, P. Gunasekaran	Microbial Bioremediation	2007	MJP Publishers
3.	R. C. Dubey, D.K. Maheswari	A Text Book of Microbiology	3^{rd} / 2003	Chand Publishing
4.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5th /1993	Tata McGraw-Hill, Inc, Newyork

References

1. Ec Eldowney, S., Hardman, D.J. and Waite, S. 1993. Pollution: Ecology and Biotreatment – Longman Scientific Technical
2. Baker, W.C. and Herson, D.S.1994. Bioremediations – McGraw Hill Inc., New York
3. Ernest, W.C.1982. The Environment of the Deep sea, Vol II, J. G. Morin Rubey.
4. Rheinmer, G.1977. Microbial Ecology of Brackish Water environment: Ecological Studies – Vol-25, Springer – Verlag Nerlin – Heidellberg New York.
5. Norris, J.R and Pettipher, G.L.(1987). Essays in Agricultural and Food Microbiology, John wiley and Sons, Singapore.
6. Harold J.Benson, 1994. Microbiological applications. Wm.C.Brown Publishers, Melbourne, Australia.
7. Burges, A. and Raw, F. 1967. Soil Biology. Academic Press, London.
8. Martin Alexander Wiley. 1961. Introduction to Soil Microbiology. International Edn., New York.
9. Vanghan, D. and Malcolm, R.E.1985. Soil Organic Matter and Biological Activity. Martinus Nighoff W.Junk Publishers.

Course Code	Course Title	L	T	P	C
20116AEC55L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	2

Aim:

- To analyze microbiological quality of food samples.

Objectives

- Microbiological tests used in the food industry.
- To study and characterize the foor borne microorganisms.

Outcome

CO1 - To Analyze the microbes in food and dairy industry products

CO2 - To understand the Production methods of Food and dairy products using microbes

CO3 - To gain Knowledge about Molecular Genome analysis and quantification

CO4 - To understand the Isolation of DNA and amplification using PCR technique.

CO5 - To know about Protein and DNA separation technique

Lab work

1. Assessment of milk quality by methylene blue reduction test
2. Wet mount preparation of fungal organism from spoiled bread, tomato, grapes, potato.
3. Observation of food samples to *study Leuconostoc sp. Lactobacillus sp., Streptococcus lacti* and *Saccharomyces*
4. Preparation of yoghurt
5. Determination of thermal death time (TDT) and thermal death point (TIP) of microorganisms from spoiled foods
6. Direct microscopic examination of milk by standard plate count(SPC) method
7. Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
8. Isolation of chromosomal DNA from bacteria by Spectrophotometric assay.
9. Development of competent cells in ***E. coli***.
10. Isolation of antibiotic resistant auxotropic mutants.
11. Protoplast and Spheroplast isolation

Demonstration

1. Fermenting ability of yeast
2. Antibiotic resistance – plasmid mediated – chromosomal mediated – Gel Electrophoretic methods.
3. Principles and applications of agarose gel electrophoresis and plasmid sepearation in agarose gel.

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
20116DSC54A	Proteomics	4	1	0	3

Aim

To understand the proteome present in the living system and their interactions.

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

CO1- To acquire knowledge in protein functional and expressions.

CO2- To get Knowledge about 3-D structural prediction of proteins

CO3- To Study the protein purification with various chromatograpy techniques.

CO4- To Know about MALDI-TOF (Matrix assisted laser Desorption and Ionization)

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 filteration, 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

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
20116DSC54B	Bioinoculants	4	1	0	3

Aim:

- To study the importance of microbes as bioinoculants/biofertilizers.

Objectives

- To give an overview about role of microorganisms for the cycle of carbon, nitrogen, phosphorus and sulphur in the nature with a special focus on agrosystems.
- Importance of microorganisms for agricultural production and commercial composts.

Outcomes

CO1- To acquire knowledge in microbial products
CO2- To know the Separation techniques of primary and secondary metabolites
CO3- To grasp the Applications of value added products
CO4- To know the microbial inoculants in agricultural practices

UNIT – I

General account of the microbes used as a biofertilizersmfor crop plants and their advantages. Symbiotic N2 fixers: Rhizobium- Isolation, characterization, identification, classification, inoculum, production and field application. Frankia- Isolation, characterization-actinorrhizal nodules-non-leguminous crop symbiosis.

UNIT – II

Non-symbiotic N2 fixers-Azospirillum-Free living-Azotobacter-free isolation, characterization, mass inoculum production and field application.

UNIT – III

Symbiotic N2 fixers- Cyanobacteria, Azolla- Isolation, characterization, mass multiplication-role in rice cultivation- Crop response- field application- immobilization.

UNIT – IV

Phosphate solubilizers- phosphate solubilizing microbes- Isolation, characterization, mass inoculum production, field application- Phosphate solubilization mechanism.

UNIT – V

Mycorrhizal bioinoculants- classification- importance of mycorrizal Ectomycorrhizae-Endomycorrhizae- Ectendo mycorrhizae- Taxonomy of mycorrhizae- Isolation of VA mycorrhizae- quantification and assessment of VAM in roots- Mass inoculum production VAm-field applications of Ectomycorrhizae and VAM.

Reference:

Kannaiyan, S. (2003). Biotecnology 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.

Course Code	Course Title	L	T	P	C
20116DSC54BC	Molecular Immunology	4	1	0	3

OUTCOME:

CO1- Theory linked to cells and organs related to the immune system.

CO2- Able to know Immune response and immune mechanism.

CO3 - Concept of central dogma of the cell and gene regulation.

CO3 - Principles and applications of various molecular 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 - theories of antibody production - Complement properties and functions of complement components;

Unit - III

Major Histocompatibility complex- Gene regulation and lr – 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 – 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, Immunolfluorescence, ELISA, Radio Immuno Assays.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Ivaitt Roitt, Jonathan Brostoff, David Male	Immunology	3rd/1993	Mosby Inc, St. Louis, MO
2.	R.A. Goldsby, T. J. Kindt, B.A. Osborne, J. Kuby	Immunology	5th/2003	W.H. Freeman and Company
3.	M.S. Aslam	Immunobiology	1st/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
20116DSC54BD	Algae Biotechnology	4	1	0	3

AIM

To understand the gene and its role in genetic engineering aspects

OBJECTIVES

- To learn the basic principles of nucleic acid and recombinant technology.
- To understand the relationships between molecule/cell level phenomena.
- Studying the concepts and mechanism of central dogma.

COURSE OUTCOME

CO1 Characterize the different groups of algae.
CO2 Describe the cultivation and harvesting of algae.
CO3 Identify the commercial applications of various algal products.
CO4 Apply microalgae for environmental applications.
CO5 Employ microalgae as alternate fuels.

Course Details:

UNIT I:

Introduction to Algae - General characteristics. Classification of algae according to Fritsch. Salient features of different groups of algae. Distribution - Freshwater, brackish water and marine algae. Identification methods. An overview of applied Phycology. Economically important microalgae.

UNIT II:

Cultivation of freshwater and marine microalgae - Growth media. Isolation and enumeration of microalgae. Laboratory cultivation and maintenance. - Harvesting of microalgae biomass.

UNIT III:

Microalgae in food and nutraceutical applications - Algal single cell proteins. Cultivation of Spirulina and Dunaliella. Microalgae as aquatic, poultry and cattle feed. Microalgal biofertilizers. Value-added products from microalgae.

UNIT IV:

Microalgae in environmental applications. Phycoremediation - Domestic and industrial waste water treatment. High-rate algal ponds and surface-immobilized systems - Treatment of gaseous wastes by microalgae.

UNIT V:

Microalgae as feed stock for production of biofuels - Carbon-neutral fuels. Lipid-rich algal strains - Botryococcus braunii. Drop-in fuels from algae - hydrocarbons and biodiesel, bioethanol, biomethane, biohydrogen and syngas from microalgae biomass.

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
20116AEC56L	Agricultural and Environmental Microbiology Lab	0	0	3	2

Aim:

- Understanding the techniques to study the environmental / agriculture microorganisms.

Objectives

- Isolation and characterization of agriculture important microbes.
- To study the environmental microbes and their impact.

Outcome

CO1 - To acquire the information about microbes role in agriculture

CO2 - To Learn about Biofertilizer production

CO3 - To Know about microbes and its role in environment

Lab work

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

Course Code	Course Title	L	T	P	C
201ACLSPSL	Professional Skills	-	-	-	2

Aim:

Course Objectives :

The Objectives of the course are to help students/candidates:

1. Acquire career skills and fully pursue to partake in a successful career path
2. Prepare good resume, prepare for interviews and group discussions
3. Explore desired career opportunities in the employment market in consideration of an
individual SWOT.

Course Outcomes :

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

1. Prepare their resume in an appropriate template without grammatical and other errors and
using proper syntax
2. Participate in a simulated interview
3. Actively participate in group discussions towards gainful employment
4. Capture a self - interview simulation video regarding the job role concerned
5. Enlist the common errors generally made by candidates in an interview
6. Perform appropriately and effectively in group discussions
7. Explore sources (online/offline) of career opportunities
8. Identify career opportunities in consideration of their own potential and aspirations
9. Use the necessary components required to prepare for a career in an identified occupation
(as a case study).

Unit I: Resume Skills

Resume Skills : Preparation and Presentation

- Introduction of resume and its importance
- Difference between a CV, Resume and Bio data
- Essential components of a good resume

ii. Resume skills : common errors

- Common errors people generally make in preparing their resume
- Prepare a good resume of her/his considering all essential components

Unit II: Interview Skills

i. Interview Skills : Preparation and Presentation

- Meaning and types of interview (F2F, telephonic, video, etc.)
- Dress Code, Background Research, Do's and Don'ts
- Situation, Task, Approach and Response (STAR Approach) for facing an interview
- Interview procedure (opening, listening skills, closure, etc.)
- Important questions generally asked in a job interview (open and closed ended questions)

ii. Interview Skills : Simulation

- Observation of exemplary interviews
- Comment critically on simulated interviews

iii. Interview Skills : Common Errors

- Discuss the common errors generally candidates make in interview
- Demonstrate an ideal interview

Unit III: Group Discussion Skills

Meaning and methods of Group Discussion

- Procedure of Group Discussion
- Group Discussion- Simulation
- Group Discussion - Common Errors

Unit IV: Exploring Career Opportunities

Knowing yourself – personal characteristics

- Knowledge about the world of work, requirements of jobs including self-employment.
- Sources of career information
- Preparing for a career based on their potentials and availability of opportunities

Course Code	Course Title	L	T	P	C
20116AEC61	Industrial Microbiology	4	1	0	4

Aim:

- Understanding the industrial importance of microorganisms and their products.

Objectives

- To study the development of industrial microbiology and microbes of industrial prominence.
- To aquire knowledge on design of fermentors and its types.
- Industrial production of various pharmaceutical and commercial products using microbes.

Outcomes

CO1- To understand the vital role of various substrate used in fermentation.

CO2- To Learn the different types of reactors or fermenters.

CO3- To gain knowledge about upstream and downstream processing

Co4 - To acquire the knowledge on different product production

UNIT – I

Historical development of Industrial Microbiology, Industrially important microorganisms, Primary and secondary screening and preservation of industrially important strains. Microbial strains improvement. Primary and secondary metabolites.

UNIT – II

Fermenter: Design, types and basic functions of fermenter. Fermentation media formulation strategies, Essential factors (pH and temperature, incubation), carbon, nitrogen, vitamin and mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams, types of fermentation.

UNIT – III

Downstream processing: Product recovery and purification (intracellular and extracellular), cell disruption, precipitation, filtration, centrifugation, solvent recovery, chromatography, ultrafiltration, drying, Enzyme and cells immobilizations and its applications.

UNIT – IV

Microbial products of pharmaceutical value – raw materials, organism and Industrial processes involved in the production of Pencillin, Streptomycin, Vitamin B12, Riboflavin and rabies vaccine.

UNIT – V

Microbial products of Industrial value – Raw materials, organism and Industrial processes involved in the production of ethanol, vinegar, amylase, protease, glutamic acid. Recycling and safe disposal of Industrial wastes through microbes.

Text Book

1. Stanbury, P.F.Whitaker, A.Hall, S.J. 1995. Principles of Fermentation Technology, Pergamon Press.
2. Sikyta, B.1983. Methods in Industrial Microbiology, Ellis horwood limited.

3. Click, B.R.Pasternak, J.J.1994. Molecular Biotechnology – ASM Press.

Reference:

1. Demain A.L.Solomon, N.A.1986. 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
20116SEC62	Clinical Microbiology	4	1	0	5

Aim:

- To understand the clinical significance of microorganisms.

Objectives

- To study virulance of pathogenic microbes.
- To understand the pathogenesis and treatment methods of various diseases
- To understand the various diagnostic techniques.

Outcomes

CO1- To Understand the basic and general concepts of Normal flora of the human body

CO2 –To Understand the sources of infectious diseases and transmission

CO3 - To Study the pathogenicity of bacterial, fungal, protozoa and viral diseases

CO4- To Understand the preventive measures of Hospital acquired infections

UNIT – I

Basics in Medical microbiology - Infectious diseases overview. Medically important microbes. Normal microbial flora of the human body, Host-microbe interactions – virulence factors of microbes. Invasiveness and pathogenicity. Immunity of microbial diseases

UNIT – II

Diagnostic Microbiology – collection and transport of specimen for Microbiological examination – General methods for isolation and identification of bacteria. Typing of bacterial isolates. Sero-diagnosis.

UNIT – III

Clinical symptoms. Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following bacterial infections (a) Streptococcal infections, (b) Staphylococcal infections, (c) Meningits, (d) Tuberculosis, (e) Leprosy, (f)Gastrointestinal disorders – typhoid, cholera, bacillary dysentery, (g) Sexually transmitted diseases – syphilis, gonorrhea. (h) Anerobic wound infection – tetanus, gas gangrene.

UNIT – IV

Clinical symptoms. Epidemiology, pathogenesis, laboratory diagnosis, prevention and treatment of the following viral infections (a) Respiratory infections, common cold, influenza, measles, mumps and rubella. (b) neurological infection – encephalitis (Dengue, Japanese encephalitis), Rabies (c) Liver diseases : Hepatitis A,B,C,D & E (d) Immunodeficiency diseases, AIDS, CMV (Cytomegaloviruses) Herpes simplex viruses.

UNIT – V

Clinical symptoms. Epidemiology, pathogenesis, laboratory, prevention and treatment of the following fungal and protozoan infections (a) Fungal – superficial, subcutaneous and systemic mycoses, (b) Protozoan: Amoebiasis, Malaria, Leishmaniasis, (c) Helminths – Filariasis, Ascariasis, Zoonotic diseases, Hospital acquired infections.

Text Book

1. Schaechter, M.Medoff, G. and Eisenstein, B.C.(1993). Mechanism of Microbial Diseases. 2nd edition. Williams & Wilkins, Baltimore.
2. J.C. Collee, J.P., Duguid, A. C. Fraser, B.P. and Marimon (1989). Mackie and Mc Carteny Practical Medical Microbiology – 13th Edition, Churchill Livingstone.

Reference:

1. Ronald M.Atias (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. Huge W.B. and Russell A.D.(1989). Pharmaceutical Microbiology. IV edition. Blackwell Scientific Publicaiton, Oxford.
5. Topley / Wilson's (1990). Principles of Bacteriology, Virology and Immunity, VIII edition, Vol.III Bacterial Diseases, Edward Arnold, London.

Discipline Specific Elective - II

Course Code	Course Title	L	T	P	C
20116DSC63A	**Recombinant DNA Technology**	4	1	0	3

Aim

To explain principles and applications of recombinant DNA technology.

Objectives

- To illustrate creative use of modern tools and techniques for manipulation and analysis of genomic sequences
- To expose the application of recombinant DNA technology for current research.
- To train students in methodologies employed in genetic engineering techniques.

Outcome

CO1- To acquire knowledge in desired DNA and proteinseparation.

CO2- To Learn the gene and operon concept

CO3- To gain Knowledge about gene cloning and cDNA library

CO4- To Learn the blotting techniques.

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.

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 engmeermg 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
20116DSC63B	Bioethics	4	1	0	3

Aim:

- To recognise and understand ethical concepts in biological research.

Objectives

- Understands and can apply the various theories and principles of bioethics
- Can scrutinise and identify health, administrative and public health policies to identify ethical issues
- Bioethics in medicine and clinical research

Outcomes

CO1- To identify ethical issues in a research proposal

CO2- To Understand the Intellectual property Rights (IPR) and patent filling.

CO3- To gain Knowledge about to ensure ethical conduct of biomedical research

CO4- To Describe the basic concepts of legal, ethical, economic, and regulatory measurements.

UNIT – I

General Ethical concerns: the use of nature, Different views of nature, Dynamic nature, interfering with nature, integrity of species; Reducing genetic diversity; Biological warfare; public perception of science.

UNIT – II

Medical ethics; History and culture: The Hippocratic tradition: a profession, Philanthropy, Do no harm, adoption to the oath by western medicine. Competing ethical. Traditions; Retaining the Hippocratic oath.

UNIT – III

Status of Human embryo: Human Embryonic development; Ethics through embryo development: Fertilization, the fetus and feeling pain; Scientific Research on Human Embryos: Experimental goals of Human Embryo Research, Human Development; How much Embryo experimentation in ethical?

UNIT – IV

Animal Rights: Making new strains of animal: Ethical limits of animal use: Religious views of animal status; Philosophical views of animal status; regulations.

UNIT –V

Human Gene therapy: Ethics of somatic cells gene therapy: Efficiency of treatment; safety of transferred genes; protecting human life; Affect on family life; Economic factors; when we should use Gene therapy?

References:

Nancy, S. Jecker., Albert R. Johnson, Robert A. Pearlman. Bioethics: An Introduction to history, methods and practice (1997). Sudbury, M. A, ; Jones and Barlett Publishers.

Tom, L. Beauchamp., childress, F. Principles of biomedical ethics, 5^{th} edition, Oxford University Press. 2000.

Course Code	Course Title	L	T	P	C
20116DSC63C	Microbiome	4	1	0	3

CO1-Introduction to the Human Microbiome
CO2-How the Microbiome is Studied
CO3- The Human Gut Microbes
CO4-Modification of the Microbiome
CO5- Functional Studies of the Microbiome

Unit -I

Overview of course; format, readings, syllabus, grading - Description of the bacteria, archaea, viruses, fungi and Protists that comprise the microbiome. The human microbiome, composition at various sites in health. Source of the organisms in the human microbiome. Ecological concepts of disease *eg*. dysbiosis.

Unit -II

DNA-based analysis of microbial communities, 16S rRNA gene amplicon sequencing and shotgun metagenomics sequencing methods. - Functional analysis of the microbiome from DNA sequence functional analysis, metatranscriptome, metabolome, proteome, and glycome.

Unit -III

Composition and function along the GI tract eg., stomach, ileum and stool. Gut microbiome changes in various diseases including liver diseases, obesity, diabetes, and other disorders. Effects of diet and medications on the gut microbiome.

Unit -IV

Effects of antibiotics. Probiotics and prebiotics. Fecal transplant. Future strategies to modify the microbiome at various sites.

Unit -V

Measurement of microbial products (the metabolome, proteome and glycome) Role of microbiome and its products, nutrition, metabolism, the gut brain axis, and in immune-inflammatory processing.

Course Code	Course Title	L	T	P	C
20116DSC63D	Tissue Culture	4	1	0	3

OUTCOMES

- To know the basic technique of tissue cultures
- To produce new plants through this tissue culture
- To gain the knowledge about tissue culture in crop improvements.
- To know the applications of tissue culture in various fields.

Unit I

Introduction - history, scope and concepts of basic techniques in plant tissue culture. Laboratory requirements and organisation. Sterilization-filter, heat and chemical. Media preparation.

Unit II

Cell, tissue and organ culture - 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 - Organogenesis - 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 - Protoplast culture -Protoplastfusion - spontaneous, mechanical, induced electrofusion, selection of somatic hybrids, cybrids, importance.

Unit V

Cryopreservation and gene bank - Application of tissue culture in forestry, horticulture, agriculture and pharmaceutical industry, transgenic plants.

REFERENCES

1. Bhojwani, S.S. and Razdan, M.K. (1983). *Plant Tissue Culture: Theory and Practice*. Elsevier Science Publishers, Netherlands.
2. Dodds, J.H. and Roberts, I.W. (1985). *Experiments in Plant Tissue Culture*. Cambridge University Press, UK.
3. Fowler, M.W. (1986). *Industrial Application of Plant Cell Culture. In: Yeoman, M. M. (ed.). Plant Cell Culture Technology*. Blackwell, Oxford, London.
4. Hammoond, J., McGarvey, P. and Yusibov, V. (2000). *Plant Biotechnology*. Springer Verlag, New York.
5. Johri, B.M. (1982). *Experimental Embryology of Vascular Plants*. Narosha Publishing House, New Delhi.

Course Code	Course Title	L	T	P	C
20116DSC63E	Nanotechnology	4	1	0	3

Aim

To understand about nanotechnology principles and its applications

Objective:

To gain knowledge about Nanotechnology and its commercial promise

Outcomes:

To understand the basic principles and method of Nanotechnology

To know the applications of Nanotechnology

To understand the groundbreaking innovations in medicine and medical implants, environment and other field

Unit I Introduction to bionanotechnology

Milestones in History – bionanotechnology – concept and future prospects – application in Life Sciences. Terminologies – nanotechnology, bionanotechnology, nanobiomaterials, biocompatibility, nanomedicine, nanowires, quantum Dots, nanocomposite, nanoparticles, nanosensors. Biotechnology to bionanotechnology, natural bionanomachines. Current status of bionanotechnology.

Unit II Synthesis of nanoparticles

Molecular nanotechnology – nanomachines – collagen. Uses of nanoparticles – cancer therapy – manipulation of cell and biomolecules. Cytoskeleton and cell organelles. Types of nanoparticles production – physical, chemical and biological. Microbial synthesis (bacteria, fungi and yeast) of nanoparticles – mechanism of synthesis.

Unit III Types of nanoparticles and methods of characterization

Nanoparticles – types, functions – Silver, Gold and Titanium. Physical and chemical properties of nanoparticles. Characterization of nanoparticles – UV-Vis spectroscopy, particle size analyzer, Electron Microscopy – HRTEM, SEM, AFM, EDS, XRD. Other tools and techniques required for bionanotechnology: rDNA technology, site directed mutagenesis, fusion proteins, X- Ray crystallography, NMR. Bioinformatics: molecular modeling, docking, computer assisted molecular design.

Unit IV Applications of bionanotechnology

Drug and gene delivery – protein mediated and nanoparticle mediated. Uses of nanoparticles in MRI, DNA and Protein Microarrays. Nanotechnology in health sectors. Nanomedicines, Antibacterial activities of nanoparticles. Nanotechnology in agriculture. Toxicology in nanoparticles – Dosimetry.

Unit V Merits and demerits of nanoparticles

Advantages of nanoparticles – drug targeting, protein detection, MRI, development of green chemistry – commercial viability of nanoparticles. Disadvantages – pollution and health risks associated with nanoparticles.

REFERENCES

1. Parthasarathy BK. Introduction to Nanotechnology, Isha Publication. 2007.
2. Elisabeth Papazoglou and Aravind Parthasarathy. Bionanotechnology. Morgan and Claypool Publishers. 2007.
3. Bernd Rehm. Microbial Bionanotechnology: Biological Self-assembly Systems and Biopolymer-based Nanostructures. Horizon Scientific Press. 2006.
4. David E Reisner and Joseph D Bronzino. Bionanotechnology: Global Prospects. CRC Press. 2008.
5. Ehud Gazit. Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology. Imperial College Press. 2006.

Course Code	Course Title	L	T	P	C
20116AEC64L	Industrial Microbiology Lab	0	0	3	2

Aim:

- To train students for industrial production of microbial products.

Objectives

- Methods for screening of industrial important microbes.
- Production of various commercial products using microorganisms.

Outcomes

CO1- To acquire hands on training various microbes for industrial practices

CO2- To know the Screening of desired microbes

CO3-To Learn the optimization process for scale up process

CO4-To understand the technical knowledge on upstream and downstream processing.

Lab work

1. Whole cell immobilization – alginate –Cyanobacteria
2. Estimation of citric acid - *Aspergillus*
3. Estimation of ethanol - Fruit juice
4. Spawn production - Mushroom
5. Mushroom cultivation
6. Starch hydrolysis

Demonstration

1. Preparation of fermented food –cheese

Course Code	Course Title	L	T	P	C
20116SEC65L	Clinical Microbiology Lab	0	0	3	2

Aim:

- To provide technical knowledge on collection and processing of clinical samples.

Objectives

- To isolate and identify the pathogens present in clinical samples.

Outcomes

CO1- To Get practical knowledge in specimen collection and processing
CO2- To gain Knowledge about cyst and protozoa identification.
CO3- To know the Technical practice on diagnosis of pathogenic infection

CO4- To Determine antimicrobial activity of microorganisms.

Lab work

1. Examination of parastic ova and cysts from faecal samples.
2. Identificaiton 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*
- *Tryponema pallidium*
- *Leptospira sp.*
- *Bacillus subtilis*
- *Klebsiella sp.*
- *E.coil.*
- *Clostridium tetani*.
- Permanent mounts of dermatophytes
- *Candida* sp.
- *Cryptococcus* sp.
- *Maduromycetes*.

Course Code	Course Title	L	T	P	C
201ACLSCET	**Community Engagement**	-	-	-	1

Aim:

Course Objectives:

- To develop an appreciation of rural culture, life-style and wisdom amongst students
- To learn about the status of various agricultural and rural development programmes
- To understand causes for rural distress and poverty and explore solutions for the same
- To apply classroom knowledge of courses to field realities and thereby improve quality of Learning

Course Outcomes:

After completing this course, student will be able to

- Gain an understanding of rural life, culture and social realities
- Develop a sense of empathy and bonds of mutuality with local community
- Appreciate significant contributions of local communities to Indian society and economy
- Learn to value the local knowledge and wisdom of the community
- Identify opportunities for contributing to community's socio-economic improvements

UNIT I - Appreciation of Rural Society

Rural life style, rural society, caste and gender relations, rural values with respect to community, nature and resources, elaboration of "soul of India lies in villages" (Gandhi), rural infrastructure.

UNIT II- Understanding rural economy & livelihood

Agriculture, farming, landownership, water management, animal husbandry, non-farm livelihoods and artisans, rural entrepreneurs, rural markets

UNIT III Rural Institutions

Traditional rural organisations, Self-help Groups, Panchayati raj institutions (Gram Sabha, Gram Panchayat, Standing Committees), local civil society, local administration

UNIT IV Rural Development Programmes

History of rural development in India, current national programmes: Sarva Shiksha Abhiyan, Beti Bachao, Beti Padhao, Ayushman Bharat, Swatchh Bharat, PM AwaasYojana, Skill India, Gram Panchayat Decentralised Planning, NRLM, MNREGA, etc.

Open Elective

Course Code	Course Title	L	T	P	C
201ENOEC	**Journalism**	**4**	**0**	**0**	**2**

Aim :

- To acquaint with the basic knowledge of journalism

Objective:

- To instil in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub-editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist
- Explore the different kinds of news

UNIT- I

Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements

UNIT- II

News – Definition, Kinds, Elements, Sources

UNIT- III

Reporters

UNIT- IV

The Editor and the Sub-editor

UNIT –V

Language of Journalism, Style

Qualities of a Writer

Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		

Course code	Course Title	L	T	P	C
201MAOEC	Development of Mathematics Skills	4	0	0	2

Aim:

- To understand the concepts from the five branches of mathematics

Objectives

- Knowledge and understanding are fundamental to study mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems.
- To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Outcomes

- Know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, Statistics, Matrices and Business mathematics)
- Use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

P.A.Navanitham, Business Mathematics & Statistics

Kanti Swarup, P.K.Gupta and Manmohan, "Operations Research"

Course Code	Course Title	L	T	P	C
201PHGEC	Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

- To build the strong foundation in physics of students needed for the field of Instrumentation.
- To prepare student to apply reasoning informed by the contextual knowledge to practice.
- To provide opportunity for students to work as part of teams on multi-disciplinary projects.

UNIT – I: INTRODUCTION

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin's and Norton's theorem – Bridges : AC bridges – Maxwell, Owen, Schering and deSauty's bridges – Wien bridges.

UNIT – II: ELECTRONIC INSTRUMENTS – I

Basic characteristics of instruments – resolution – sensitivity - Audio frequency oscillator, Conversion of galvanometer into voltmeter and ammeter – resistance meter - Amplified D.C. meter – Chopper stabilized amplifier – A.C. Voltmeter using rectifiers – Electronic multimeter – Differential voltmeter – Digital voltmeters – Component measuring instruments (quantitative studies)]

UNIT – III: ELECTRONIC INSTRUMENTS – II

Signal conditioning systems – DC and AC carrier systems – Instrumentation amplifiers – Vibrating capacitor amplifier – Analog to digital data and sampling – A/D and D/A convertor (successive approximation, ladder and dual slope converseons).

Unit IV – Recording Devices

Recorders necessity – Recording requirements – Analog recorders – Graphic recorders – strip chart recorders – Galvanometer types recorders – Null type recorders.

Unit V – CRO

CRO – Construction and action – Beam transit time and frequency limitations – Measurement of potential, current, resistance, phase and frequency – Special purpose oscilloscopes – Sampling storage oscilloscope.

Books for Study

1. Electronic Instrumentation and Measurement techniques – W.D. Cooper and A.D. Helfrick – PHI – Third edn. – 1989

Learning Outcomes:

- Appreciate important practical aspects of theoretical knowledge: how important components work, when to impedance match, non-ideal behaviour of op-amps etc.
- Acquire a sound understanding of the role of noise in measurement systems and know how to apply noise reduction techniques.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhmey – DhanpatRai and Sons – 1990.

2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Course Code	Course Title	L	T	P	C
201CEOEC	Food and Adulteration	4	0	0	2

Aim:

- To introduce students to food safety and standardization act and quality control of foods.

Objectives:

- To educate about common food adulterants and their detection.
- To impart knowledge in the legislatory aspects of adulteration.
- To educate about standards and composition of foods and role of consumer.

Outcomes:

- The students will have knowledge about different processing and preservation methods and principles involved.

Unit-I Introduction to Food Chemistry

Introduction to Food Chemistry- Water (Structure of water and ice, Physical constants of water, Types of water, Water activity) Composition of Food- Carbohydrates, Proteins, Lipids, Vitamins & Minerals.

Unit- II Food Pigments

Introduction- classification, types of food pigments- chlorophyll, carotenoids, anthocyanins, flavanoids.

Unit – III Food Preservation

Introduction - Importance, principle and Types.

High and low temperatures preservation - Pasteurization - Sterilization- Canning- Freezing- Refrigeration.

Unit – IV Food Additives

Introduction- antioxidants, sequestrants, preservatives, nutrient supplement, emulsifiers, stabilizers and thickening agents, bleaching and maturing agent, sweeteners, humectants and anti -caking agents, coloring and flavoring substance.

Unit-V Food Adulteration

Types of adulterants- intentional and incidental adulterants, methods of detection. Detection of common food adulterants in Spices , Grains, Coffee , Tea, Oil fats , Food colours and Milk. Health hazards and risks.

References:

1. The Food Safety and Standard ACT, 2006 – Seth & Capoor
2. Hand book of Food Adulteration and Safety Laws – Sumeet Malik
3. Food Science – B.Srilakshmi

Course Code	Course Title	L	T	P	C
201CSOEC	E Learning	4	0	0	2

COURSE OBJECTIVES

- Learn the basics of E-Learning concepts.
- Learn the content development techniques.

COURSE OUTCOMES

- Develop e – learning application on their own.
- Ability to develop contents for e-learning.
- To perform course management using tools.

UNIT I INTRODUCTION

Introduction – Training and Learning, Understanding elearning, components and models of e-learning, Advocacy of e-learning – benefits, learning styles, criteria for choosing, - Applications of E-learning.

UNIT II CONCEPTS and DESIGN

E-Learning Strategy, the essential elements of elearning strategy, Quality assuring e-learning, suppliers and resources, virtual learning environments, authoring tools, e-assessment, Learning Design Issues – purpose, general principles, designing live e-learning, designing self managed learning.

UNIT III APPLICATIONS

Moodle 2.0 E-Learning Course Development – Features, Architecture, Installation and Configuring Site.

UNIT IV COURSE MANAGEMENT

Creating – Categories, Courses, Adding Static Course Material – Links, Pages, Moodle HTML Editor, Media Files, Interacting with Lessons and Assignments – Evaluating Students – Quizzes and Feedback.

UNIT V ENHANCEMENT

Adding Social Activities - Chat, Forum, Ratings, Blocks – Types, Activities, Courses, HTML, Online Users – Features for Teachers.

REFERENCE BOOKS:

1. Delivering E-Learning: A complete Strategy for Design, Application and Assessment, Kenneth Fee, Kogan page, 2009.
2. Designing Successful e-Learning, Michael Allen, Pfeiffer Publication, 2007.
3. Moodle 2.0 E-learning Course Development, William Rice, PACKT, 2011.
4. Moodle 2.0 First Look, Mary Cooch, 2010.

Course Code	Course Title	L	T	P	C
201CAOEC	Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Technology.

OBJECTIVE

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

OUTCOMES:

- Acquire knowledge about functionalities of world wide web
- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages
- Acquire knowledge about Open source JavaScript libraries
- Able to design front end web page and connect to the back end databases.

UNIT I

Introduction to the Internet: networking- internet – email – Internet Technologies: modem internet addressing .

UNIT II

Internet browsers: Internet Explorer – Netscape navigator- Introduction to HTML: Html document – anchor tag – hyperlink.

UNIT III

Head and body sections: Header section – titles – links- colorful web page – sample html document – Designing the body section: paragraph – tab setting.

UNIT IV

Ordered and unordered lists: list – unordered list – heading in a list- order list- nested list.

UNIT V

Table handling: tables – table creation in html cell spanning multiple rows and columns- coloring cells- sample tables- frames frame set definition- nested frames set.

REFERENCE BOOKS

1.World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

2. Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
201CMOEC	Open Elective – Banking Service	4	0	0	2

AIM:

To Provide the Bank is financial institution which is involved in borrowing and lending money.

OBJECTIVE:

- To provide a lending money to firms, customers and home buyers.
- To provide keep money for customers
- To provide offering financial advice and related financial services, such as insurance.

OUTCOME:

To help to gather knowledge on banking and financial system in India

To provide knowledge about commercial banks and its products

To create awareness about modern banking services like e-banking-banking and internet banking, ATM System

To introduce recent trends in banking system

To make the student understand the basic concept of banking and financial institutions and expose various types of risk based by banks

UNIT – I

Commercial Banking – An Overview: Banking-Classification- Banking system- Universal Banking- Commercial Banking- functions – Role of Banks in Economic Development

UNIT – II

E-banking –An Overview: Meaning-Service-E-banking and Financial Services –Benefits-Internet Banking –Internet Banking Vs Traditional Banking –Mechanics of Internet Banking-Services

UNIT – III

Mobile Banking and Telephone Banking –An Overview: Meaning-Features-Registration-Services –Security Issues –Banking Facilities- Telephone Banking System – Drawbacks- Call Centers

Unit – IV

ATM and Electronic Money: Concept of ATM-Features-Functions-Strategic importance of ATM- Electronic Money – Categories –Merits – E-Money and Monetary Policy-Policy Issues for the RBI

Unit-V

EFT System and INFINET: Meaning- Steps in EFT- RBI Guidelines-EFT Systems Vs Traditional System - ECS-Features-Factors- Benefits –Handicaps -Applications

REFERENCES:

1. Banking theory law and Practice
2. Banking Theory law and practice -Santhanam
3. Banking Awareness - N.K.Gupta
4. Management of Banking and financial Services-Padmalathasuresh,Justin paul .

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School of Arts and Science
Department of Microbiology
M. Sc., Syllabus-Regulation 2020

Course Code	Course Title	L	T	P	C
	SEMESTER I				
20216SEC11	Prokaryotic Microbiology	6	1	0	5
20216SEC12	Eukaryotic Microbiology	6	1	0	5
20216SEC13	Microbial Physiology	6	1	0	4
20216SEC14L	Fundamentals of Microbiology Lab	0	0	4	2
20216DSC15_	Discipline Specific Elective I	5	0	0	4
20216RLC16	Research Led Seminar	-	-	-	1
	Total	**23**	**3**	**4**	**21**
	SEMESTER II				
20216SEC21	Industrial Microbiology	5	1	0	5
20216SEC22	Environmental and Agricultural Microbiology	5	1	0	5
20216SEC23	Clinical Microbiology	5	0	0	4
20216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	4	2
20216DSC25_	Discipline Specific Elective II	5	0	0	4
20216RMC26	Research Methodology	3	0	0	2
20216BRC27	Participation in Bounded Research	-	-	-	2
	Total	**23**	**2**	**4**	**24**
	SEMESTER III				
20216SEC31	Microbial Genetics	6	1	0	6
20216SEC32	Microbial Biotechnology	6	1	0	6
20216SEC33L	Microbial Genetics and Biotechnology Lab	0	0	5	3
20216DSC34_	Discipline Specific Elective III	5	0	0	4
202_OEC	Open Elective	4	0	0	4
20216SRC35	Design/Socio technical research	-	-	-	2
	Total	**21**	**2**	**5**	**24**
	SEMESTER IV				
20216SEC41	Pharmaceutical Microbiology	6	1	0	6
20216SEC42	Biostatistics and Bioinformatics	6	1	0	6
20216SEC43L	Pharmaceutical Microbiology Lab	0	0	5	3
20216SEC44_	Discipline Specific Elective IV	5	0	0	4

20216PRW45	Project Work	-	-	-	6
20216PEE	Programme exit examinations	-	-	-	2
	Total	17	2	5	27
	Total Credits for the Program				**96**

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a) 20216DSC15A- Immunotechnology b) 20216DSC15B-Bioremediation and Waste Management
	Discipline specific Elective Courses-II
II	a) 20216DSC25A-Biomolecules b) 20216 DSC25B- Genomics and Proteomics
	Discipline specific Elective Courses-III
III	a) 20216DSC34A- Plant Tissue Culture b) 20216DSC34B-Nanotechnology
	Discipline specific Elective Courses-IV
IV	a) 20216DSC44A- Bioethics and IPR b) 20216DSC44B-Molecular Immunology

Open Electives

Semester	Open Elective Courses
III	a) 202ENOEC-Writing for the media b) 202MAOEC-Applicable Mathematics Techniques c) 202PHOEC-Bio-Medical Instrumentation d) 202CHOEC-Green Chemistry e) 202CSOEC – M-Marketing f) 202CMOEC- Financial Services

Credit Distribution:

Sem	SEC	DSC	GEC	RSB courses	Others	Total
I	16	4	-	1	-	21
II	16	4	-	4	-	24
III	15	4	3	2	-	24
IV	15	4	-	6	2	27
Total	**62**	**16**	**3**	**13**	**02**	**96**

Course Code	Course Title	L	T	P	C
20216SEC11	Prokaryotic Microbiology	6	1	0	5

AIM :

- Prokaryotic Microbiology introduces basic principles and then applies clinical relevance of many etiological agents responsible for global infectious diseases.

OBJECTIVES :

- The infectious disease cycle of the pathogens enables to solve the epidemics.
- The territory covered by infections and the immune response expands each year; we focus on pathogenic mechanisms in order to foster a student's ability to solve problems in their future clinical career.

COURSE OUTCOME

CO1- Scope and historical importance of microbiology

CO2- Understanding the features and classification of prokaryotes.

CO3- study about isolation and identification of microbes

CO4- Economic value of beneficial bacteria

Unit – I

Microbial classification and diversity of microorganisms – classification based on cellularity, cell and kingdom concepts – Whittaker's classification – major group of prokaryotic microorganisms – their characteristics – microbial diversity of viruses, bacterial and cyanobacteria.

Unit – II

Viruses: Introduction – Classification of viruses – cultivation of viruses, purification and assay, various methods of viral assays. Basic structure of viruses – symmetry – biochemical composition of viruses – Bacteirophages – Ultra structure of T_4 phage – multiplication of bacteriophages – viruses of fungi and algae, slow viruses, viroids, satellite viruses.

Unit – III

Plant viruses: Classification of plant viruses. Tobacco Mosaic Virus – Ultra structure of TMV, Multiplication of TMV. Viruses of various plant hosts / crops and diseases - Plant viruses as gene vectors.

Unit – IV

Bacteriology: Introduction – Diversity of bacterial flora – distribution – morphology of typical bacterial cell – Chemical composition of bacterial cell wall, Reproduction and genetic recombination, Transformation, Conjugation, Transduction, Bacterial growth rate, Bacterial culture methods and culture media for various bacteria. Isolation and enumeration of bacterial cultures, Identification – Gram staining technique, Bacterial diseases of Man.

Unit – V

General characteristics of other Bacteria – Mycobacteria, Myxobacteria, Rickettsia and Chlamydiae and Cyanobacteria – Classification of cyanobacteria – significance of Cyanobacteria in biofertilizers – *Archaeobacteria, Actinomycetes, Streptomyces, Actinoplanes, Maduramycetes* and their general characters

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5th /1993	Tata McGraw-Hill, Inc, New york
2.	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3rd/ 2003	Chand Publishing

Reference Book:

1. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20216SEC12	Eukaryotic Microbiology	6	1	0	5

AIM

- To gain the knowledge with the various inner and outer structures of prokaryotes and in detail.

OBJECTIVES

- To learn the general principles and applications of microbiology

COURSE OUTCOME

CO1- General Features and taxonomy of eukaryotes

CO2- Knowledge about advanced research in mycology, phycology.

CO3- Scope of Algae used as a food

CO4- Economic importance of Lichens and algae

Unit – I

Differentiation of Eukaryotes and Prokaryotes – Salient features of Eukaryotes – Major groups of Eukaryotes – Algae, Fungi, Protozoa and lichens – Classification of Algae, Fungi and Protozoans. Significance of various Algae and fungi in Agricultural Microbiology - Significance of various fungi, algae in environmental biology – biodegradation of Xenobiotics, heavy metals and pesticides, Eukaryotic microbes in Bio pesticides.

Unit – II

Algae: Phycology – Introduction – Distribution of Algae, General features of algae Classification and general characters of prochlorophyta, Rhodophyta, Phaeophyta: Significance of Algae in production.

Unit – III

Biology of Lichens – fungal components and algal component: general characteristics of lichens, physiology of lichens, classification of lichens, Reproduction of lichens, Economic uses of lichens. Single cell protein (SCP) – Spirulina and significance: BGA and significance in agriculture.

Unit – IV

Mycology – Introduction – General characters of Fungi – Structure of fungi – Fungal cell, multiplication of fungi – Fungal diseases of Plants, Animals and Human - Beneficial fungi, VAM – fungi in soil fertility. Predaceus fungi and nematophagous fungi – Fungi in food spilage and food infections.

Unit – V

Protozoans – Classification of Protozoa – General Characters of protozoa – general structure and life cycle of Amoeboid form – Nutrition and Reproduction in protozoans – Protozoan diseases of Animals and Man

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5th /1993	Tata McGraw-Hill, Inc, New york
2	R.C. Dubey, D.K. Maheshwari	A Text Book of Microbiology	3rd/ 2003	Chand Publishing

References

1. Microbiology (1993) Jr. M.J. Peczar, E.C.S. Chan and N.R. Kreig, Mc Graw Hill Inc., NewYork
2. General Microbiology, 1976. Roger Stanier, Fifth Edition,
3. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Course Code	Course Title	L	T	P	C
20216SEC13	Microbial Physiology	6	1	0	4

AIM :

- To enable the students to understand the physiology and metabolism of microorganismS.

OBJECTIVES :

- To impart knowledge on metabolic function and biochemical reaction going on inside the microbial cell.
- To teach metabolic pathways, their regulation and engineering, and methods used in their elucidation.
- To teach students about cell cycle, growth and methods to determine microbialgrowth.

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 Exopolysacchairdes; 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 cruve – 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, phosphorescenses – bacterochlorophyll – rhodopsin – carotenoids – phycobiliproteins: Carbohydrates – anabolism – autotrophy – oxygenic – anoxygenic photosynthesis – autotrophic generation of ATP; fixation of CO_2 – Calvin cycle – C_3 – C_4 pathways. Chemolithotrophy – sulphur – iron – hydrogen – nitrogen oxidations – Brief account of methanotrophs in relation to CO_2 fixation.

Unit – IV

Microbial respiration and fermentative pathway: Respiratory metabolism – Embden Mayer Hoff pathway – Enter Doudroff pathway – glyoxalate pathway – Krebs cycle – Oxidative and substrate level phosphorylation – reverse TCA cycles – Gluconeogenesis – Pasteur Effect – Fermentation of carbohydrates – homo and heterolactic fermentations. Cell division – endospore – structure – properties – germination.

Unit – V

Spore structure – Function: Cell division – endospore – structure – properties – germination – Microbial development, sporulation and morphogenesis. Hyphae vs yeast forms and their significance. Multicellular organization of selected microbes – Dormancy.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5th /1993	Tata McGraw-Hill, Inc, Newyork
2	S. Meenakumari	Microbial physiology	1st / 2006	MJP Publishers

Reference Book:

1. Microbial physiology and metabolism (1995) D.R. Caldwell, Wm. C.Brown, Publishers. USA

2. Microbial Physiology (1988). A.G. Moat and J.W. Foaster, John Wiley & Sons, New York.

Course Code	Course Title	L	T	P	C
20216SEC14L	Fundamentals of Microbiology Lab	0	0	4	2

AIM

- A student undertaking this course will be learning the principles behind the basic techniques

OBJECTIVES

- This course is put forward with the objectives of equipping the candidates with practical knowledge on basic techniques involved in the isolation,
- Characterization and identificationdifferent types of microorganism.

COURSE OUTCOME :

CO1- practical knowledge about isolation and purification of microbes from various sources.

CO2- Training about staining experiments

CO3- Handling on light and compound microscope.

CO4- Learn essential biochemical analysis

EXPERIMENTS

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, Capusule 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)

Reference:

1. Cappuccino and James, G(1996) Microbiology a laboratory manual, Addison Wesley Publishing company Inc. 4th Edition, England, California
2. Gerhardt. P. Murray, R.G. Wood, W.A. and Kreig, N.R. (1994) Methods of General and Molecular Bacteriology, Ed. Amercian 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 Bacterilogy (Vol.II), Nobert pfeming Springer Publishers

Discipline Specific Elective-I

Course Code	Course Title	L	T	P	C
20216DSC15A	Immunotechnology	5	0	0	4

AIM:

- To expose the students with the immune system of human body

OBJECTIVES:

- Objectives The aim of this course is to impart knowledge on the basic concepts of cells and components of immune system and immuno diagnostic techniques

COURSE OUTCOMES (CO'S):

CO1- Learn scope and history of immunology.

CO2- Study about immune system and lymphatic organs.

CO3- Learn tumor immunology

CO4- gain knowledge about various immunological techniques

Unit – I

Introduction: History of immunology – types of immunity – Innate and Acquired – Passive and Active - Humoral and cell Mediated Immunity. Lymphoid organs – autoimmunity, physiology of immune response — Immunohaematology

Unit - II

Antigens and Antibodies: Antigens – structure and properties – types – ISO and allo –haptons; adjuvants – antigen specificity, vaccines and toxoids. Immunoglobulins – structure - heterogeneity – types and subtypes – properties (physico – chemical and biological); theories of antibody production - Complement – structure – components - properties and functions of complement components; complement pathways and biological consequences of complement activation

Unit - III

Major Histocompatibility complex: Structure and function of MHC and the HLA system. Gene regulation and lr – 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, Immunolfluorescence, 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.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Ivaitt Roitt, Jonathan Brostoff, David Male	Immunology	3rd/1993	Mosby Inc, St. Louis, MO
2.	R.A. Goldsby, T. J. Kindt, B.A. Osborne, J. Kuby	Immunology	5th/2003	W.H. Freeman and Company
3.	M.S. Aslam	Immunobiology	1st/2000	Campus Book International

References

1. Immunology (2002), C.V Rao, First Edition, Narosa Publications.
2. Essentials of Clinical Immunology (1986) H.Chapel and Halbey, ELBS
3. Essentials Immunology (1994) M.Rolt Blackwell Scientific Publication, Oxford

Course Code	Course Title	L	T	P	C
20216DSC15B	Bioremediation and Waste Management	5	0	0	4

AIM

- To study the water and waste water treatment for recycleing process.

OBJECTIVES:

- To impart knowledge on the management of solid and liquid wastes frommunicipal and industrial sources and principles of remedial measures of recycling,reuse and recover from the wastes.

COURSE OUTCOMES:

CO1- Understanding on the management of solid and liquid wastes

CO2- Learn the principles of remedial measures of recycling, reuse and recover from the wastes.

CO3- Understand the mechanism and role of microbes in the degradation of various pollutants

UNIT – I

Wastes– Classification and Quantification – Solid Waste Management and Disposal: Sources and Generation of Solid Waste – characterization, composition and classification. Hazardous Waste Management: Cyanides, Dioxins, Detergents, Plastics, Nylon and Paper. Waste Minimization approaches – Monitoring and Management strategies. Radioactive Waste: Sources, half life of radioactive elements, modes of decay. Effects on Plants, Animal and Man. Low and High-level Radioactive Waste Management – Waste Minimization and Treatment, Radiation standards.

UNIT - II

Recycling of Wastes – Types – sources – composition of waste – recycling of waste for Industrial, Agricultural and Domestic Purposes; Recycling of Metals, Reuse, recovery and reduction of paper and plastics; Recycling in Food Manufacturing, Beverages, Apparel, Leather, Paper, Pulp, Chemical and other industries; Fly Ash utilization. Waste Disposal Methods – composting, incineration, pyrolysis, medical waste disposal strategies.

UNIT – III

Microbial Activity in Soil and Ground Water, Lithosphere as Microbial habitat, Microorganisms in rock and minerals, Mineral soil and Organic soil. Physiological groups of prokaryotes, Geomicrobial transformations – Biodegradation of carbonates – Biomobilization of silicon, phosphate, nitrogen. Geomicrobiology of fossil fuel, methane, peat, coal and petroleum.

UNIT – IV

Principles of Bioremediation – Rapid growth and Metabolism- Genetic plasticity – Metabolic pathways for the degradation of xenobiotics, hydrocarbons – Microbial site characterization – Biodegradation potential – Bioprocess design, optimization – Microbial removal rates – inherent problems associated with biotreatment studies. Microbiological methodologies – Standard biotreatability protocols – Quantification of biodegradation;

Biocleaning -Chernobyl radioactive contaminated area - Phytoremediation.

UNIT – V

Aerobic Bioremediation: Bioremediation of Surface Soils: Fate and transport of contaminants in the Vadose zone – Biodegradation in soil ecosystems – Types of soil treatment systems – Bioreactors. Subsurface Aerobic Bioremedidation: in situ Bioremediation – in situ Bioventing – in situ treatments of Harbour Sediments and Lagoons. Bioremediation in fresh water and marine systems: Bench and Pilot Scale studies – in situ Bioreactor treatment of sediments – in situ treatment in marine ecosystem. Anoxic/Anaerobic Bioremediation: Anoxic/Anaerobic Processes –Fermentation, Degradation of xenobiotics – Anoxic/Anaerobic bioremediation of hydrocarbons, Phenols, Chlorophenolic compounds, Polycyclic Aromatic Hydrocarbons (PAH), Heterocyclic Compounds, Cyanide, dyes,

REFERENCES

1. Microbial Ecology, IV Ed., Atlast, 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 Jercy.
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.

Course Code	Course Title	L	T	P	C
20216SEC21	Industrial Microbiology	5	1	0	5

AIM

- To study about the industrially importance microorganisms, fermenter design, fermentation process.

OBJECTIVE

- To give knowledge on strain improvement methods.
- To learn about upstream fermentation process .
- To understand about downstream fermentation process

OUTCOME.

CO1- Students will get knowledge on strainimprovement.

CO2- Enable them to work in fermentationindustry.

CO3- Students will get idea on upstream and downstream fermentationprocess

CO4- Economic importance of Bio products

Unit I

Historical development of industrial microbiology: major classes of products and processes and micro organisms used in industrial processes. Industrially important microbes and their development: Screening methods for industrial microbes –strain selection and improvement – Mutation and recombinant DNA techniques for strain development. Batch culture and continuous culture

Unit – II

Fermenters – Design of a fermenter, and components – asepsis and containment requirements – body construction and temperature control – aeration and agitation systems – sterilization of fermenter, air supply, and medium; aseptic inoculation methods – sampling methods, valve systems –monitoring and control devices and types of fermenters and its basic functions.

Unit – III

Downstream processing – extraction, separation, precipitation, filtration, centrifugation, cell disruptions, liquid-liquid extraction, chromatography, recovery & purification, process and quality control.

Unit – IV

Production of Primary metabolites: Organic acids (citric acid, lactic acid, acetic acid) and Amino acids (glutamic acid, lysine). Production of Vitamins (B2 and B12). Production of Secondary metabolites: Antibiotics: beta-lactams (Penicillins, Cephalosporins), aminoglycosides (streptomycin), macrolides (erythromycin) and Quinones (Tetracycline).

Unit –V

Bio products: Bio-pesticides, bio-fertilizers, natural bio-preservatives (Nisin), High Fructose Corn Syrup, Bioplastics and biopolymers (Poly Lactic acid, Poly Glutamic acid, Poly hydroxyl alkoanates, Xanthum Gum and Dextran), Biotransformations - steroids and non-steroids. Enzymes - Proteases, amylases, lipases, cellulases, pectinases, glucose isomerase, L-Asparaginase. Production of vaccines and recombinant proteins (Insulin, Streptokinase). Production of Biofuels (Biomethanol, Bioethanol, Biobutanol, Biohydrogen and Biodiesel).

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1	L.E. Casida Jr	Industrial Microbiology	1968	Wiley
2	W. Crueger and A. Crueger	A text book of Industrial microbiology	2^{nd}/1990	Sinauer Associates Incorporated
3	Prescott and Dunn's	Industrial Microbiology	4^{th}/1987	CBS Publishers and Distributors

References

1 Alexander, M.(1961). Introduction to soil microbiology, Wiley and Sons Inc. New York and London
2 Demain, A.L. and Davies, J.E (1999) Manual of Industrial Microbiology and Biotechnolgy. ASM Press
3 Glick, B.R and Pasternak, JJ(1994) Molecular Biotechnology, ASM Press
4 Stanbury, P.F, Whitaker, A. and Hall, S.J.(1991). Principles of Fermentation Technology, Pergamon Press
5 Glick, B.R and Pasternak, JJ(1998) Molecular Biotechnology, II Edition , ASM Press, New York
6 Mittal, D.P.(1999) Indian Patents Law, Taxmann, Allied Services (P) limited
7 Tortora, G.J., Fernke, .B.R. and Case, C.L.(2001), Microbiology – An Introduction, Benjamin Cummings

Course Code	Course Title	L	T	P	C
20216SEC22	Environmental and Agricultural Microbiology	5	1	0	5

AIM

- To study about the biofertilizers, plant disease and increasing soil fertility.v

OBJECTIVES

- To educate the students about concepts of designs of water distribution systems, sewer networks, working principles and design of various physical, chemical and biological treatment systems of water and wastewater.

COURSE OUTCOME (CO)

CO1- Huge Insights into these precious areas of Environmental microbiology.

CO2- Students able to know detailed idea about biofertilizer production and plantdisease**.**

CO3**-** Role ofMicrobes in marine and fresh water environment

CO4- Scope of Recycling of Liquid and Solid wastes

Unit I

Aerobiology- Significance of air microflora - Microbial air pollution- sources, biological indicators and effects on plants and human beings. Enumeration of bacteria from air, Air sampling devices, Outline of Airborne diseases (Bacterial, Fungal and Viral), Air sanitation. Biogeochemical cycles -Nitrogen, Carbon,
Phosphorous, Sulphur, Iron and their importance.

Unit II

Microbes in marine and fresh water environment – eutrophication – Water pollution – sources and nature of pollutants in water – sewage – treatment of liquid waste – primary, secondary and tertiary treatment – water borne diseases – Assessment of water quality – BOD and COD. Solid waste treatment – saccarification and pyrolysis.

Unit III

Recycling of Liquid and Solid wastes-Composting-Biogas, Mushroom and SCP production from waste. Biodegradation of complex polymers (Cellulose, Hemicellulose, Lignin, Chitin and Pectin), Bioremediation (*In-situ, Ex-situ*, Intrinsic), Bioaugmentation and Biostimulation. Bioleaching (Copper and Uranium) -Xenobiotics degradation (Heavy metals).

Unit IV

Microbial association with plants - Phyllosphere, Rhizosphere, Mycorrhizae, nitrogen fixing organism – symbiosis, asymbiosis, associate symbiosis – phosphate solubilizers – application of biofertilizers in agriculture. Biology of nitrogen fixation – genes and regulations in *Rhizobium.*

Unit V

Bacterial, viral and fungal plant pathogens. Morphological, physiological changes with reference to disease establishment in plants – plant protection – phenolics – phytoalexins and related compounds. Disadvantages of chemical pesticides. Microbial pesticides- types, mechanisms, advantages and limitations.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	B. Nagamani	Soil And Agricultural Microbiology	1st/ 2007	Margham Publicat
2.	Dirk, J., Elasas, V., Trevors, J.T., Wellington	Modern Soil Microbiology	1997	Marcel Dekker INC
3.	**R.R. Mishra**	Soil Microbiology	1st/2004	CBS Publication

References

1. Atlas Ronald M, Bartha Richard. Microbial Ecology 2nd Edition. Benjamin/Cummings Publishing Company, California. 1987.
2. Baker WC and Herson DS. Bioremediation – McGraw Hill Inc., New York. 1994.
3. Chatterji AK. Introduction to Environmental Biotechnology. 2005
4. Christon J Hurst, Manual of Environmental Microbiology.2nd edition. American Society for Microbiology, Washington. 2002.

Course Code	Course Title	L	T	P	C
20216SEC23	Clinical Microbiology	5	0	0	4

AIM

- To inculcate on the role of normal flora and pathogenic microbes.

OBJECTIVE

- To understand the pathogenesis of various diseases
- To understand the various clinical microbiological techniques.

OUTCOME

CO1-Learn normal flora of human body

CO2- Get information about various sources ofinfection 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 diagnositic 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) Meningitisd) Diphtheriae) Pulmonary Tuberculosis,f) Leprosy, g) Typhoid, h) Cholera i) Tetanus, j) Syphillis, 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, Filariosis, **Hospital acquired infections:**Hospital infections Principles of control – Committee – functions; Hospital waste disposal – Ethical committee – functions.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Sherris	Medical Microbiology	4^{th}/2004	McGraw-Hill Companies, Inc.
2.	V.V. Kale, K.P. Bhusari	Applied Microbiology (Pharmacy and other Bioscience)	1^{st}/2001	Himalaya Publishing House
3.	Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig.	Microbiology	5^{th} /1993	Tata McGraw-Hill, Inc, Newyork

References

1 Schachter, M., Med off, G. and Eisenstein, B.C.(1993) mechanism disease, 2^{nd} 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^{th} Edn. Arnold a division of Hodder and Stoughton.

5 Wistriench, G.A. And lechtonan, M.D.(1988). Microbiology, 5^{th} Edn., Mac publishing company NY

6 Atlas, R.M. (1989) Microbiology – fundamentals and applications 2^{nd} Edn. Maxwell Mac Millan International Edition

Course Code	Course Title	L	T	P	C
20216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	4	2

AIM

- To provide technical knowledge on collection and processing of clinical samples .

OBJECTIVE

- To prepare them to work in clinical laboratory .
- To learn the technique for isolation and identification of pathogens

OUTCOME

CO1- Get practical knowledge in specimen collection and processing

CO2- Become technically expert which will helpful to work in clinical laboratory

CO3- Learn practical understanding of diagnosis of pathogens.

CO4- Acquire knowledge on fermentation process

CO5- Learn bio fertilizer and inoculants production

Industrial and Clinical Microbiology

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. Determintion 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

Reference:

1. Clescri,L.S., Greeberg,A.E., and Eaton, A.D.(1998) Standard Methods for Examination of Water and Waste Water, 20^{th} Edition, Amercian 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 Cunning(1995) Official Methods of Analysis, Vol I and II, 16^{th} Edition, Arlington, Virginia, USA, AOAL.
4. Richard G., Burus and Howard Slater (1982) Experimental Microbial Ecology, Blackwell Scientific Publishers
5. Tuffery(1996). Laboratory Animal, an Introduction, II Edition, John Wiley and Sons New York

Discipline Specific Elective-II

Course Code	Course Title	L	T	P	C
20216DSC25A	Biomolecules	5	0	0	4

AIM

To know the functions of Biomolecules

OBJECTIVE :

- To understand the structure and functions of carbohydrates, lipids , proteins and nucleic acids
- To understand the role of nucleic acid in proteins synthesis

OUTCOME

CO1- They acquire knowledge in the quantitative and qualitative estimation of biomolecules

CO2- They study the influence and role of structure in reactivity of biomolecules

CO3- Students have a thorough understanding on the role of biomolecules and their functions.

Unit I

Carbohydrates: Structure and biological functions of Mono, di and Polysaccharides. Types of polysaccharides: Homo polysaccharides -chitin, fructans, mannans, xylans, and galactans. Structure and biological importance of Hetero polysaccharides- Glycoprotein – bacterial cell wall polysaccharides, marine polysaccharides and Lectins.

Unit II

Aminoacids and its general properties. Classification of amino acids. Proteins– classification and general properties. Orders of protein structure, Primary- Secondary structure– the α-helix, β- pleated sheet. Protein sequencing methods.

Unit III

Lipids: Definition and classification of lipids. Biological significance of lipids. Types of Fatty acids-Essential, Non essential. Structure and biological functions of phospholipids, sphingolipids, glycolipids. Steroids – structure and functions of cholesterol, bile acids, sex hormones, ergosterol. Structure and biological role of prostaglandins, thromboxanes and leukotrienes.

Unit IV

Nucleic acid: Structure of purines, pyrimidines, nucleosides and nucleotides. DNA double helical structure. A, B and Z forms of DNA. Properties of DNA- Density, viscosity, hypochromicity, denaturation and renaturation. DNA sequencing– chemical and enzymatic methods. Chemical synthesis of DNA. RNA– types and biological role- Secondary, tertiary structures of RNA.

Unit V

Vitamins: Definition and Classification - Source, Structure and biological role - Daily requirements and deficiency manifestation of fat soluble vitamins and water soluble vitamins.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	J. L. Jain	Fundamentals of Biochemistry	1^{st} / 2005	S. Chand and Company

References

1. Biochemistry Dubay 4th edition William C.Brown Publication, 1998.
2. Biochemistry. Davidson and Sittmann, NMS 4th ed. Lippincott William's and Wilkins, 1999
3. Biochemistry – Voet and Voet. J O H N WI VP &*Publisher* Kaye Pace Associate Publisher, 2011.
4. Biochemistry Student Companion, by Berg, 7th Edition Berg, Jeremy M. / Tymoczko, John L. / Stryer, Lubert Published by W. H. Freeman, 2011.

Course Code	Course Title	L	T	P	C
20216DSC25B	Genomics and Proteomics	5	0	0	4

AIM

To know the basic principles of genes and proteins

OBJECTIVES:

To understand the gene functions and its genetic engineering aspects

To understand the protein functions and its genetic engineering aspects

COURSE OUTCOME :

CO1- Students gain the knowledge about the interactions between the proteins

CO2- Get the information to predict cell behavior or develop drug targets.

CO3- Rapidly evolving scientific area into ***genomes***, proteomes and databases

CO4- Learn to store various data NCBI, DDBJ and EMBL

Unit I

Genomics: genetic and physical maps, physical mapping and map-based cloning, choice of mapping population, simple sequence repeat loci, southern and fluorescence in situ hybridization(FSH) for genome analysis, chromosome microdisection, 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, spinspin 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 engymes, application in vaccine development, drug development, sensor development.

References

1. Gupta, P.K. 2004. Biotechnology and Genomics. First edition. Rastogi Publications, Meerut.
2. Miglani, G.S. 2007. Advanced Genetics. New Delhi: Narosa Publishing House.
3. Primrose, S.B. and Twyman, R.M. 2006. Principles of Gene Manipulation and Genomics. Blackwell Publishing, Australia.
4. Singh, B.D. 2009. Biotechnology: Expanding Horizons. Second Edition. Kalyani Publishers, Ludhiana.
5. Singh, B.D. 2009. Plant Biotechnology. Kalyani Publishers, Ludhiana.
6. Thompson, J.D., Schaeffer-Reiss, C., and Ueffing, M. 2008. Functional Proteomics. Methods and Protocols. Humana Press, New York.
7. Twyman, R.M. 2004. Principles of Proteomics. Taylor & Francis.

Course Code	Course Title	L	T	P	C
20216RMC26	Research Methodology	3	0	0	2

AIM:

- The course is to understand the principles and applications of classical and modern techniques in Biology develop skill in preparation of reports, writing research communications and thesis

OBJECTIVES:

- To impart understanding on the concepts of statistics and to improve the Computing knowledge of the statistical methods related to environment

COURSE OUTCOMES:

CO1- Understanding research questions and tools

CO2- Experience in scientific writings

CO3-Practice in various aspects of scientific publications

CO4-Inculcation of research ethics

Unit I

Research Selection of problem-stages in the execution of research: choosing a topic to publication- preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, Bibilograpy. 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.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	C. R. Kothari	Research Methodology	2^{nd} / 2004	New age international publishing (p) Ltd.
2.	S. Rajkumar	Research Methodology	1^{st} / 2008	Anuradha Publication
3.	Jerrold H. Zar	Biostatistical Analysis	4^{th}/2003	Pearson Education (Singapore) Pte. Ltd.
4.	D. J. Homie and Hazel Peck	Analytical Biochemistry	3^{rd} / 1998	Longman group

References

1. An introduction to practical biochemistry by David T. Plummer.
2. Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2^{nd} Edition 1999.
3. Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3^{rd} 1999.
4. Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2^{nd} edition, Pp 160, ISBN: 081208005
5. Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plagrave Macmillan, Pp256. ISBN 1403905843.

Course Code	Course Title	L	T	P	C
20216SEC31	Microbial Genetics	6	1	0	6

AIM

- The emergence of molecular genetics has revolutionized large areas of modern biological and biochemical research work it has had a huge impact on the biotechnology industry.

OBJECTIVE

- To extend the knowledge on molecular basis of mutation at microbial level
- To focus on gene regulation and expression mechanisms
- To understand the principles role of plasmids and gene transfer methods

OUTCOME

CO1- Understood genome organization of model organisms.

CO2 - Learn molecular mechanisms that underlie mutations.

CO3- Study about transformation,transduction and conjugation.

CO4- Are able to describe the nature of the transposable elements

Unit I

Trends in Gene discovery. Nucleic acids as genetic information carriers: concept of gene – allele, cistron, replicon – origin of mutation – mutagens – physical, chemical and biological agents. Induced mutation types – mechanisms of mutation induction – suppression of mutations – Intergenic and intragenic suppression.

Unit II

Transformation- Griffith experiments, natural or artificial competence transformation in Bacillus, E. coli, ***Haemophilus*** and ***Streptococcus*** – mechanism of recombination – genetic mapping.

Unit III

Bacterial conjugation – F plasmid – structure and functions. Origin of Conjugation – Hfr and F' strains. Interrupted and uninterrupted mating – time map and recombination map. Conjugation in ***E. coli, Pseudomonas.*** Plasmids, F-factors description and their uses in genetic analysis. Colicins and col factors.

Unit IV

Transduction – generalized and specialized transduction – P1 phage – mechanism of gene transfer through lambda and P1 phages. HFT and LFT lysate. Co- transduction – transduction mapping.

Unit V

Regulation of bacterial gene expression – Operon model – lac, ara, trp and his operons, operon concept, catabolite repression, instability of bacterial RNA, positive and negative regulation, inducers and co-repressors. Attenuation – lac and trp operons; Human genetics: pedigree Analysis, Genetic disease through gene map, Micro array techniques, Single nucleotide polymorphisms (SNPs)

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	Larry Snyder, Wendy Champness	Molecular Genetics of Bacteria	1997	American society of Microbiology
2.	David Freifelder	Molecular Biology	2nd/1990	Narosa Publishing House
3.	William S. Klug, Michael R. cummings	Concept of Genetics	7th/2003	Pearson Education(Singapore) Pte. Ltd.

References

1. Siger, M., Berg, P. (1991). Genes and Genomes, University Science Book.
2. Snustad, D., Simmons, J. and Jenkins, B. (1997). Principles of Genetics, First edition, John Wiley and Sons.
3. Watson, J.D., Hopkins, N.H., Roberts, J.W., Stietz, J.A. and Weiner, A.M. (1998). Molecular biology of the gene, 4th edition, Benjamin / Cummings Publishing Company.

Course Code	Course Title	L	T	P	C
20216SEC32	Microbial Biotechnology	6	1	0	6

AIM

To understand the gene and its role in genetic engineering aspects

OBJECTIVES

- To learn the basic principles of nucleic acid and recombinant technology.
- To understand the relationships between molecule/cell level phenomena.
- Studying the concepts and mechanism of central dogma.

COURSE OUTCOME

CO1- Developed an understanding in recombinant DNA technology.

CO2- candidate to recollect the basics of Molecular Genetics and apply a cognitive thinking.

CO3-Possibilities ranging from the treatment of human diseases to develop novel medicines

Unit I:

Nucleic acids – Types- DNA, RNA- structures, functions. Vectors – plasmids (Ti plasmids, pBR322, pSC101, pUC), cosmids, bacteriophages- Structures and functions. DNA replication- process,enzymology and inhibitors of replication. Enzymes-DNA polymerases, RNAses, Ligases, Taq polymerases, Topoisomerases-uses and applications. DNA damage-Types (deamination,oxidative damage, alkylation, pyrimidine dimmers. Repair mechanisms.

Unit II:

Gene-definition, concepts, structure and functions. Cloning techniques, Genomic librarary. RAPD, RFLP, AFLP and SSR marker in molecular studies and its application. Principles and techniques of Nucleic acid hybridization, protein sequencing and blotting techniques, PCR, DNA fingerprinting.

Unit III:

Biotechnology-Definitions, Concepts and Scope, History and achievements. Screening for products from microorganisms – Inoculum development – Long term preservation of microbes. Biological approaches in microbial production of aminoacids, organic acids, antibiotics, vitamins, steroids and sterols.

Unit IV:

Strain improvement – Applications of mutation, Recombination and DNA Technology. Recombinant DNA Technology – Principles and applications, enzymology of process. Restriction enzymes – Types, recognition sites and specificity.

Unit V:

Biotransformation – Strategies and techniques involved in the process. Immobilization methods – advantages, immobilization production of Mabs. Insulin, somatotropin, IFNs, Vaccines by cloning. Microalgal biotechnology – Dunaliella, Biotechnological potentials of microalgae as food, feed, fuel and pharmaceuticals.

Text Books:

1. Benjamin, L (1990). Gene. IV Edn. Oxford Univ. Press, Oxford.
2. Berg. M.M. and Howe, M.M(1989). Mobile DNA. American society for Microbiology, Washington D.C.
3. Brown, T.(1991) Essential Molecular Biology – A Practical approach. Vol.I Vol II Oxford Univ. Press. Oxford.

Course Code	Course Title	L	T	P	C
20216SEC33L	Microbial Genetics and Biotechnology Lab	0	0	5	3

AIM:

- To facilitate the students to know the biotechnological aspects in plant growth and improvement.

OBJECTIVES

- Genetic laboratory course to introduce the students to learn about prokaryotic and eukaryotic• genetic system using modern techniques.

OUTCOMES

- This curse will provide to this students about the mechanics of experimentation methods of genetics.

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 auxotropic mutants.
6. Separation of proteins using Column chromatographic techniques (Gel filtration).
7. Immobilization techniques – alginate beads.
8. Estimation of citric acid and ethanol.

DEMONSTRATION

1. Gel Electrophoretic methods.
2. UV transillumination

Course Code	Course Title	L	T	P	C
20216SEC34A	Plant Tissue Culture	5	0	0	4

AIM:

- To facilitate the students to know the tissue culture aspects in crop improvement

OBJECTIVES

- To understand the basic principles of tissue culture technique and its applications

OUTCOMES

- To know the basic technique of tissue cultures
- To produce new plants through this tissue culture
- To gain the knowledge about tissue culture in crop improvements.
- To know the applications of tissue culture in various fields.

Unit I

Introduction - history, scope and concepts of basic techniques in plant tissue culture. Laboratory requirements and organisation. Sterilization-filter, heat and chemical. Media preparation - inorganic nutrients, organic supplements, carbon source, gelling agents, growth regulators and composition of important culture media (MS, White,s and Gamborg's media).

Unit II

Cell, tissue and organ culture - Isolation of single cells, selection and types of cells, tissue explants and organs for culture - paper, raft nurse technique, plating method, microchamber techniques, cell suspension cultures - batch, continuous, chemostat culture - synchronization of suspension culture, cellular totipotency, cytological, cytochemical and vascular differentiations - totipotency of epidermal and crown – gall cells.

Unit III

Micropropagation - clonal propagation of elite germplasm, factors affecting morphogenesis and proliferation rate, technical problems in micropropagation. Organogenesis - formation of shoots and roots - role of growth regulators and other factors, somaclonal and gametoclonal variations. Somatic embryogenesis - Process of somatic embryogenesis, structure, stages of embryo development, factors affecting embryogenesis, synthetic seeds.

Unit IV

Haploid production - androgenesis, gynogenesis - techniques of anther culture – segmentation pattern in microspore - isolated pollen culture - plantlets from haploids - diploidisation - factors influencing androgenesis, haploidy through gynogenesis, haploid mutants, utilization of haploids in plant breeding. Protoplast culture: Isolation of protoplasts - mechanical and enzymatic sources, culture of protoplasts, viability. Protoplastfusion - spontaneous, mechanical, induced electrofusion, selection of somatic hybrids, cybrids, importance.

Unit V

Cryopreservation and gene bank - Modes of preservation, preparation of materials for deep freezing, cryopotectors, storage strategies, assessment of successful cryopreservation, application and limitations. Application of tissue culture in forestry, horticulture, agriculture and pharmaceutical industry, transgenic plants.

REFERENCES

1. Bhojwani, S.S. and Razdan, M.K. (1983). *Plant Tissue Culture: Theory and Practice*. Elsevier Science Publishers, Netherlands.
2. Dodds, J.H. and Roberts, I.W. (1985). *Experiments in Plant Tissue Culture*. Cambridge University Press, UK.
3. Fowler, M.W. (1986). *Industrial Application of Plant Cell Culture. In: Yeoman, M. M. (ed.). Plant Cell Culture Technology*. Blackwell, Oxford, London.
4. Hammoond, J., McGarvey, P. and Yusibov, V. (2000). *Plant Biotechnology*. Springer Verlag, New York.
5. Johri, B.M. (1982). *Experimental Embryology of Vascular Plants*. Narosha Publishing House, New Delhi.
6. Kalyan Kumar, De (1992). *An Introduction to Plant Tissue Culture*. New Central Book Agency, Calcutta.
7. Ramawat, K.G. (2000). *Plant Biotechnology*. S. Chand and Co. Ltd., New Delhi.
8. Razdan, M.K. (2004). *Introduction to Plant Tissue Culture* (2^{nd} ed.). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
9. Reinert, J. and Bajaj, Y.P.S. (1977). *Plant Cell Tissue and Organ Culture: A Laboratory Manual*. Narosa Publishing House, New Delhi.

Vasil, I.K. (1986). *Cell Culture and somatic Cell Genetics of Plants* (3 Volumes). Academic Press Inc.

Course Code	Course Title	L	T	P	C
20216SEC34B	Nanotechnology	5	0	0	4

Aim

To understand about nanotechnology principles and its applications

Objective:

To gain knowledge about Nanotechnology and its commercial promise

Outcomes:

To understand the basic principles and method of Nanotechnology

To know the applications of Nanotechnology

To understand the groundbreaking innovations in medicine and medical implants, environment and other field

Unit I **Introduction to bionanotechnology**

Milestones in History – bionanotechnology – concept and future prospects – application in Life Sciences. Terminologies – nanotechnology, bionanotechnology, nanobiomaterials, biocompatibility, nanomedicine, nanowires, quantum Dots, nanocomposite, nanoparticles, nanosensors. Biotechnology to bionanotechnology, natural bionanomachines. Current status of bionanotechnology.

Unit II **Synthesis of nanoparticles**

Molecular nanotechnology – nanomachines – collagen. Uses of nanoparticles – cancer therapy – manipulation of cell and biomolecules. Cytoskeleton and cell organelles. Types of nanoparticles production – physical, chemical and biological. Microbial synthesis (bacteria, fungi and yeast) of nanoparticles – mechanism of synthesis.

Unit III **Types of nanoparticles and methods of characterization**

Nanoparticles – types, functions – Silver, Gold and Titanium. Physical and chemical properties of nanoparticles. Characterization of nanoparticles – UV-Vis spectroscopy, particle size analyzer, Electron Microscopy – HRTEM, SEM, AFM, EDS, XRD. Other tools and techniques required for bionanotechnology: rDNA technology, site directed mutagenesis, fusion proteins, X- Ray crystallography, NMR. Bioinformatics: molecular modeling, docking, computer assisted molecular design.

Unit IV **Applications of bionanotechnology**

Drug and gene delivery – protein mediated and nanoparticle mediated. Uses of nanoparticles in MRI, DNA and Protein Microarrays. Nanotechnology in health sectors. Nanomedicines, Antibacterial activities of nanoparticles. Nanotechnology in agriculture. Toxicology in nanoparticles – Dosimetry.

Unit V **Merits and demerits of nanoparticles**

Advantages of nanoparticles – drug targeting, protein detection, MRI, development of green chemistry – commercial viability of nanoparticles. Disadvantages – pollution and health risks associated with nanoparticles.

REFERENCES

1. Parthasarathy BK. Introduction to Nanotechnology, Isha Publication. 2007.
2. Elisabeth Papazoglou and Aravind Parthasarathy. Bionanotechnology. Morgan and Claypool Publishers. 2007.
3. Bernd Rehm. Microbial Bionanotechnology: Biological Self-assembly Systems and Biopolymer-based Nanostructures. Horizon Scientific Press. 2006.
4. David E Reisner and Joseph D Bronzino. Bionanotechnology: Global Prospects. CRC Press. 2008.
5. Ehud Gazit. Plenty of Room for Biology at the Bottom: An Introduction to Bionanotechnology. Imperial College Press. 2006.
6. Kamali Kannangara. Nanotechnology: Basic science and emerging technologies- Mick Wilson, Overseas Press. 2005.
7. Mark A Ratner and Bandyopadhyay AK. Nano Materials. Nanotechnology: A gentle introduction to the Next Big Idea, New Age Publishers. 2002.
8. Pradeep T. Nano Essentials understanding nanoscience and Nanotechnology. 1st edition. TMH publications. 2007.
9. Parag Diwan and Asish Bharadwaj. Nanomedicines, Pentagan Press. 2006.
10. Vladimir P Torchilin. Nanoparticles as Drug Carriers. Imperial College Press, North Eastern University, USA. 2006.

OPEN ELECTIVE

Course Code	Course Title	L	T	P	C
202ENOEC	**Writing for the Media**	4	0	0	4

Aim:

- To equip students to enter into the realm of mass media.

Objective:

- To comprehend the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media
- Learn to write for the media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop-Filters- Human interest stories- Recognizing and evaluation news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

Reference Book:-

Author	Title of the book	Edition / Year	Publisher
Susan	Journalism		
John Hogenberg	Professional Journalism	2012	
M.James Neal	News Writing and Reporting		Surjeet Publication
M.V Komath	The Journalist's Handbook		
D.S Mehta	Mass Communication & Journalism		

Course Code	Course Title	L	T	P	C
202MAOEC	**Applicable Mathematical Techniques**	4	0	0	4

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrage's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
202PHOEC	**Biomedical Instrumentation**	4	0	0	4

Aim:

- To understand the concepts and application of electronic Instrumentation in the Medical field
- **Objective:**
- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

OUTCOMES:

- Define basic medical terms and physical values that can be handled by medical instrumentation,
- Describe methods and implementation of electrical and nonelectrical medical parameters diagnostic,
- demonstrate measuring of basic medical parameters,
- Calculate basic parameters of the equipment for using in electro diagnostic and electro therapy,
- Apply safety standards and select disposal method and procedures for electrical diagnostic equipment.

UNIT – I: BIO ELECTRIC SINGNALS 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 IMAGILG 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 – metical ultra sound – basic pulse – echo apparatus, A – Scan – echocardiograph(M mode).

UNIT – V: ADVANCED BIO MEDICAL SYSTEMS

Pacemakers – Need for Cardiac pacemaker – External Pace makes – Implantable Pace makers – recent development in Implantable Pacemakers – Pacing system Analyzer – Defibrillator – Pacer – Cardioverter – Physiotherapy and electro therapy equipment – High frequency heat therapy – short wave diathermy – microwave and ultrasonic therapy – pain relief through electrical simulation.

Books for Study

1. R.S Khandpur, Handbook of Biomedical instrumentation, Tata McGraw Hill publishing company Limited. New Delhi,(2003). (Unit I,II,IV & V)
2. Lestlie Cromwell, Fred J. Weibell, Erich A. Pfeiffer, Bio medical instrumentation and measurements, PHI, New Delhi.(Unit-III)

Book for Reference

1. M.Arumugam, Biomedical Instrumentation, Anuradha Agencies, Kumbakonam (2000).

Course Code	Course Title	L	T	P	C
202CHOEC	Open Elective-Green Chemistry	4	0	0	2

Aim:

- To reduce the soil and water pollution in environment.

Objectives:

- To learn about the environmental status, public awareness in evolution, principles involved in green chemistry, bio-catalytic reactions, global warming and its control measures, availability of green analytical methods.

Outcomes:

- To understand the environmental status and evolution.
  - To know about the Pollution and its prevention measures.
  - To familiarize the green chemistry.
  - To learn about the bio-catalytic reactions.
  - To understand about the vitamins and antiobiotics.

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_2 - Impact of green house effect on global climate - Control and remedial measures of green house effect - Global warming a serious threat - Important points.

Unit V - Green Analytical Methods

Future trends in Green Chemistry - Green analytical methods, Redox reagents, Green catalysts; Green nano-synthesis, Green polymer chemistry, Exploring nature, Biomimetic, Proliferation of solvent-less reactions; Non-covalent derivatization, Biomass conversion, emission control

References:

1. Introduction to Green Chemistry – M.Rayan and M.Tinnes
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
202CSOEC	**M-Marketing**	4	0	0	4

OBJECTIVES

- Understand Mobile Business strategies.
- To understand Mobile marketing tools and techniques.
- To know Mobile technologies.

OUTCOMES

- Upon Completion of the course, the students should be able to:
- Analyze various mobile marketing strategies.
- Market Mobile based Applications.
- Apply various tools in mobile marketing.

UNIT I Introduction

Mobile Marketing Campaign, Fortune 500 and Mobile Marketing, consumers engagement with mobile, Terminologies.

UNIT II Businesses Vs mobile marketing

classic mistakes in mobile marketing, laying foundation for successful mobile marketing campaign, understanding technology behind mobile marketing – Android, iOS, Windows Phone.

UNIT III

Strategic thinking about Mobile marketing campaign, Mobile Marketing Tools – setting up mobile website for different firms, using SMS, MMS and apps to drive customers to business and other ways to attract customers.

UNIT IV Location Based Marketing

LBS, NFC, Bluetooth and LBA, 2D codes, Tablet, Other Mobile Applications, Business Firms connecting to customers using Mobile – case study, Mobile Marketing for B2B companies, Mobile E-commerce to Drive Revenue.

UNIT V Mobile Payments

Present and Future Mobile Technology, Mobile Application Development.

REFERENCE BOOKS:

1. Go Mobile: Location Based Marketing, Apps, Mobile Optimized Ad Campaigns, 2D codes and other Mobile Strategies to Grow your Business, Jeanne Hopkins, Jamie Turner, John Wiley&Sons Inc., 2012.
2. M- Commerce, Paul Skeldon, Crimson Publishing, 2012.
3. M-Commerce Technologies, Services and Business Models, Norman Sadeh , Wiley 2002.
4. Mobile Commerce, Opportunities, Applications and Technologies of Wireless Business, Paul Mary, Tom Jell, Cambridge University Press, 2001.

Course Code	Course Title	L	T	P	C
202CMOEC	Open Elective- Financial Services	4	0	0	2

AIM

To analyze the various financial institutions and their services.

OBJECTIVES

1. To gain knowledge on financial services.
2. To understand importance of various services including banking, insurance, mutual funds.

OUTCOME

To introduces meaning and functions of Financial Intermediaries
To understand the role of merchant bank and its services
To provide information regarding management of mutual funds and Regulations
To understand the role and functions of financial services Marketing
To know the structure and types of debt Instruments
To realize Foreign Exchange Market

UNIT – I

Financial system-An Overview: Indian Financial System-Global Financial System-Financial Services Environment- Credit Rating –Factoring and Forfeiting –Leasing

UNIT – II

Financial Markets –An Overview: Definition-Role-Functions-Constituents-Financial Instruments-Capital Market instruments-Indian money and Capital Market-Global Financial Markets.

UNIT – III

Money Market –An Overview:
Definition-Characterstistics-Objectives-Imporatance-Functions-Segment-Financial Institutions-Indian Money Market-Global Money Market

Unit – IV

Capital Market: Money Market-Characteristics-Functions-New financial Instruments-measures of Investor Protection-Indian Capital Market-Major Issues

Unit-V

Stock Exchange: History of Stock Exchange-Functions-Indian Stock Exchanges-Organization structure-Regulations of Stock Exchange –Recent Developments

REFERENCE BOOKS

1. Gordon , Natarajan – Financial Market and Services.
2. Dr. S. Gurusamy – Financial services and Market.
3. Kucchol S.C. – Financial Management
4. Pandey I.M. – Financial Management.

Course Code	Course Title	L	T	P	C
20216SEC41	Pharmaceutical Microbiology	6	1	0	6

AIM

- The information gained will help the students to formulate novel drugs.

OBJECTIVES:

- To facilitate the students to know the definite path of metabolism of drugs and drug discovery

OUTCOMES:

- This course gives information on drug designing, novel techniques in drug discovery and the role of biotechnology in pharmaceutics.

Unit – 1 Antibiotics and synthetic antimicrobial agents

Antibiotics and synthetic antimicrobial agents, Antifungal antibiotics, antitumor substances.Peptide antibiotics, Chloramphenicol, Sulphonamides and Quinolinone antimicrobial agents.Chemical disinfectants, antiseptics and preservatives.

Unit – 2 Mechanism of action of antibiotics

Mechanism of action of antibiotics (inhibitors of cell wall synthesis, nucleic acid and protein synthesis). Molecular principles of drug targeting.Drug delivery system in gene therapy Bacterial resistance to antibiotics. Mode of action of non – antibiotic antimicrobial agents. Penetrating defenses – How the antimicrobial agents reach the targets (cellular permeability barrier, cellular transport system and drug diffusion).

Unit – 3 Microbial production and Spoilage of pharmaceutical Products

Microbial contamination and spoilage of pharmaceutical products (sterile injectibles, non injectibles, ophthalmic preparations and implants) and their sterilization.
Manufacturing procedures and in process control of pharmaceuticals.
Other pharmaceuticals produced by microbial fermentations (streptokinase, streptodornase). New vaccine technology, DNA vaccines, synthetic peptide vaccines, multivalent subunit vaccines. Vaccine clinical trials.

Unit – 4 Regulatory practices, biosensors and applications in Pharmaceuticals

Financing R&D capital and market outlook. IP, BP, USP. Government regulatory practices and policies, FDA perspective. Reimbursement of drugs and biologicals, legislative perspective. Rational drug design. Immobilization procedures for pharmaceutical applications (liposomes). Macromolecular, cellular and synthetic drug carriers. Biosensors in pharmaceuticals.Application of microbial enzymes in pharmaceuticals.

Unit – 5: Quality Assurance and Validation

Good Manufacturing Practices (GMP) and Good Laboratory Practices (GLP) in pharmaceutical industry. Regulatory aspects of quality control. Quality assurance and quality management in pharmaceuticals ISO, WHO and US certification. Safety in microbiology laboratory.

BOOKS/REFERENCE

1. Pharmaceutical Microbiology – Edt. by W.B.Hugo & A.D.Russell Sixth edition. Blackwell scientific Publications.

Course Code	Course Title	L	T	P	C
20216SEC42	Biostatistics and Bioinformatics	6	1	0	6

Unit I – Definitions

Scope of Biostatistics, probability analysis – variables in Biology, collection, classification and tabulation of data – Graphical and diagrammatical representation – scale diagrams – Histograms – frequency polygan – frequency curves. Measures of central tendency – arithmetic Mean, Median and Mode – calculation of mean, median, mode in series of individual observations, discrete series, continuous open – end classes. Measure of dispersion – Standard Deviation and Standard curves, Measures of central tendency on Variance.

Unit II – Correlation and regression

Simple correlation – Correlation coefficient – Regression simple linear regression. Basic ideas of significance test – Hypothesis testing level of significance – Test based on student 't' 'chi' square and goodness of fit. 'F' test – ANOVA.

Unit III – Databases

Biological resource databases – Examples and application – Sequence Analysis – protein and nucleic acid.

Unit IV – Genomics and proteomics

Sequencing genomes – sequence assembly – genome on the web – annotating and analyzing genome sequences. Proteomics pathway databases.

Unit V – Sequence analysis

Pair wise sequence comparison, protein data bank, SWISS-PROT, Genbank – sequence queries against biological databases – BLAST and FASTA – multifunctional tools for sequence analysis, multiple sequence alignments, phylogenetic alignment – profiles and motifs.

Text Books

S. No	Author Name	Title of the Paper	Edition/year	Publication
1.	D.R. Westhead, J. Howard Parish and Richard M. Twymans	Bioinformatics	1st /2003	Viva Books Private Limited
2.	S. Sundara Rajan, R. Balaji	Introduction to Bioinformatics	1st /2002	Himalaya Publishing House
3.	Rashidi, H.H. and Bvehler, L.K	Bioinformatics Basics: Applications in Biological Science and Medicine	2002	CRC Press, New York.

References

1. Cynthia Gibas and Per Jambek (2001) Developing Bioinformatics Computer Skills, Shroff Publishers and Distributions Pvt. Ltd., O'reilly, Mumbai.
2. Misener, S. and Krawetz, S.A. (2000). Bioinformatics Methods and protocols, Human Press Totowa, New Jessey.
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 Jessey.

Course Code	Course Title	L	T	P	C
20216SEC43L	Pharmaceutical Microbiology Lab	5	0	0	4

Aim

To provides knowledge and understanding with regards to the significance of the presence of bacteria, yeasts, moulds, viruses and toxins in **pharmaceutical** raw materials, intermediates, new products and **pharmaceutical** production.

Objective

Culture and identification of important human pathogens, microbial growth conditions, effect of antimicrobial agents, development of resistance against antimicrobial agents, sterilization and disinfection, bacterial virulence factors, production and control of vaccines.

Course outcome

CO1 - Aseptic condition relevance to healthcare and the pharmaceutical industry.

CO2 - Knowledge and understanding of the practical aspects of pharmaceutical microbiology.

CO3 - Perform practicals on antimicrobial activity

CO4- Learn the production of antibiotics from microbes.

Lab Work

1. Introduction to equipment and glassware used in microbiology laboratory (BOD, Incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, etc.,)
2. Study of morphology of different microbes
3. Preparation of various culture media (Determination of microbial colony characteristics)
4. Isolation of pure cultures by streak plate, spread plate & pour plate techniques.
5. Enumeration of bacteria by direct microscopic count.
6. Motility test by Hanging drop method
7. Microbiological assay of antibiotics by cup plate method and other methods
8. Characterization of microbes through Bio chemical reactions (IMViC)
9. Evaluation of any disinfectant by phenol coefficient test
10. Study of Oligodynamic action (of metals on bacteria)
11. Preservation of microorganisms (slant and stab cultures)
12. Sterility testing of Pharmaceuticals
13. Microbiological Analysis of Water.
14. Production of antibiotics using microbes

Course Code	Course Title	L	T	P	C
20216SEC44A	Bioethics and IPR	5	0	0	4

Aim

To understand the basic principles of Bioehtics and IPR

Objective

Students will gain awareness about Bioethics and Intellectual Property Rights (IPRs) to take measure for the protecting their ideas

Outcome

To know about Bioethics and Intellectual Property Rights (IPRs)
They will able to devise business strategies by taking account of IPRs
They will be able to assists in technology upgradation and enhancing competitiveness.
They will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health
They will gain more insights into the regulatory affairs.

Unit I

Bioethics Concept, philosophical considerations, epistemology of science, ethical terms, principles and theories and relevance to biotechnology. Ethics and the law issues - genetic engineering, stem cells, cloning, medical techniques, transhumanism and bioweapons. Research concerns - animal rights, ethics of human cloning, reproduction and stem cell research.

Unit II

Emerging issues - biotechnology's impact on society, DNA on the witness stand and use of genetic evidence in civil and criminal court cases. Challenges to public policy, regulations, improving public understanding of biotechnology products to correct misconceptions.

Unit III Introduction to IPR & Legal Protection

Basics of patents, types of patents, Indian Patent Act 1970, recent amendments, filing patent application, precautions before patenting – disclosure and non-disclosure. WIPO treaties, Budapest treaty, PCT and implications, role of a country patent office and procedure for filing a PCT application. Types of IP - patents, trademarks, copyright & related rights, industrial design, traditional knowledge, geographical indications and international framework for the protection of IP. Introduction to history of GATT, WTO, WIPO and TRIPS. Global scenario of patents and Indian position, patenting of biological materials. IP as a factor in R&D and IP relevance to Biotechnology.

Unit IV Patent Filing and Infringement

Patent application - forms and guidelines, fee structure and time frames. Types of patent applications, provisional and complete specifications, PCT and convention patent applications. International patenting - requirement, procedures and costs.

Financial assistance for patenting and introduction to existing schemes. Publication of patents -gazette of India, status in Europe and US. Patenting by research students, lecturers and scientists. University/organizational rules in India and abroad, credit sharing by workers and financial incentives. Patent infringement - meaning, scope, litigation, case studies and examples.

Unit V

Biosafety

Introduction and historical background. Introduction to biological safety cabinets, primary containment for biohazards, biosafety levels, biosafety levels of specific microorganisms, recommended biosafety levels for infectious agents and infected animals. Biosafety guidelines by Government of India. Definition of GMOs and LMOs. Roles of Institutional Biosafety Committee, RCGM, GEAC etc. for GMO's applications in food and agriculture. Environmental release of GMOs, risk assessment; risk management and communication. Overview of national regulations and relevant international agreements including Cartagena protocol.

Important Links

1. Bioethics - by Ellen Frankel Paul, Fred D. Miller, Jeffrey Paul, Fred Dycus Miller Cambridge University Press, 2002.
2. Bioethics & Science, John A. Bryant, Linda Baggott la Velle, John F. Searle – 2002.
3. http://www.w3.org/IPR/
4. http://www.wipo.int/portal/index.html.en
5. http://www.ipr.co.uk/IP_conventions/patent_cooperation_treaty.html
6. www.patentoffice.nic.in

Course Code	Course Title	L	T	P	C
20216SEC44B	Molecular Immunology	5	0	0	4

Aim:

- This subject considers immune responses at the molecular level and covers the role of immuno receptors on immune cells in the initiation of immune responses

Objective:

- To understand the immune response in molecular level

Outcome

- To describe the structure and function of immunological receptors and apply this information towards building a comprehensive understanding of the initiation of immune responses at the molecular level
- To describe the various stages of immune cell development and compare this with abnormal development in a range of immunodefficiency conditions
- To explain how immunoregulation occurs and relate it to the overall function of the immune system in the healthy host as well as in immune disease states

Unit I Fundamental Concepts and Anatomy of the Immune System

Terminology – Antigen, immunogen, hapten, allergen, tolarogen, super antigens, antibody, immunoglobulin, antigenigity, immunogenicity. Self & nonself, innate & acquired immunity. Haematopoesis. Organs, tissues, cells and mediators of immune system - primary lymphoid organs, secondary lymphoid tissues, lymphocytes, cytokines and lymphokines. Lymphatic system, lymphocyte circulation and lymphocyte homing. Mucosal and Gut associated lymphoid tissue (MALT&GALT) and mucosal immunity. Principles of cell signaling.

Unit - II Immune Responses Generated by B and T lymphocytes

B cell: B cell development, maturation, activation and differentiation. B cell receptor and determinants. B cell subsets. Immunoglobulins - basic structure, classes & subclasses of immunoglobulins, antigenic determinants, multigene organization of immunoglobulin genes and immunoglobulin super gene family. Generation of antibody diversity.

T cell: T cell development, maturation, activation and differentiation. T cell receptor and determinant. T cell subsets. TCR complex. Antigen processing and presentation - endogenous antigens, exogenous antigens, non-peptide bacterial antigens Cell to cell co-operation and hapten-carrier system.

Unit - III Immune Response

Recognition & response: Non specific and Specific. **Nonspecific**: Natural built-in barrier, phagocytosis. Complements, natural killing, inflammatory response. **Specific:** HI & CMI. Antigen recognition and response. Major Histocompatibility Complex - MHC genes, MHC in immune responsiveness and disease susceptibility. HLA typing. Kinetics of immune response and memory. **Unresponsiveness:** tolerance, suppression and potentiation.

Unit - IV Vaccinology

Active, passive and combined immunization. Live, killed, attenuated, plasma derived, sub unit, recombinant DNA, protein based, plant-based, peptide, anti- idiotypic and conjugate vaccines – production & applications. Role and properties of adjuvants & ISCOMS. Antibody genes and antibody engineering - chimeric and hybrid monoclonal antibodies, catalytic antibodies and generation of immunoglobulin gene libraries.

Unit - V Clinical Immunology

Immunity to infection, bacteria, viral, fungal and parasitic infections (with examples from each group). Hypersensitivity – Type I, II, III and IV. Autoimmunity and types of autoimmune diseases. Mechanism and role of $CD4^{+}$ T cells, MHC and TCR in autoimmunity. Treatment of autoimmune diseases. Transplantation – immunological basis of graft rejection, clinical transplantation and immunosuppressive therapy. Tumor immunology, tumor antigens, immune response to tumors and tumor evasion of the immune system. Cancer immunology and immunotherapy. Immunodeficiency - primary immuno - deficiencies, acquired or secondary immuno - deficiencies.

Text Books

1. Peter J. Delves, Seamus J. Martin, Dennis R. Burton and Ivan M. Roitt. 2011. Essential Immunology 12^{th} Edition. Wiley - Blackwell.
2. Charles A Janeway, Jr. Paul Travers, Mark Walport, and Mark J Shlomchik. 1999. Immunobiology. 4^{th} Edition. Journal of Current Biology publications.
2. D. M. Weir and John Stewart. 1997. Immunology. 8^{th} Edition. Churchill Livingstone.
3. P.J.Delves, I S.J.Artin, I D.R.Burton and I.M.Roitt. 2006. Essential Immunology. 11^{th} Edition. Wiley - Blackwell.
4. Richard M. Hyde. 2012. Microbiology and Immunology. 3^{rd} Edition. Springer Science & Business Media.

Reference Books

1. Brostoff J, Seaddin JK, Male D and Roitt IM., 2002. Clinical Immunology. 6^{th}Edition. Gower Medical Publishing.
2. Paul William E. 1999. Fundamental of Immunology. 4^{th} Edition. Lippencott Raven.
3. E Roitt. 2011. Essential Immunology. 12^{th} Edition. Blackwell Publication.

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DEPARTMENT OF MICROBIOLOGY

M.PHIL MICROBIOLOGY SYLLABUS - REGULATION 2020

Cross cutting

SEMESTER - I					
COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**C**
203_ _ _11 (Common Paper)	Research Methodology	2	2	0	2
203MBC12	Advanced Microbiology	2	2	0	2
203MBC13_	A. Microbial Biotechnology B .Bioprocess and Enzyme Engineering	2	2	0	2
CPE_RPE (Common Paper)	Research and Publication Ethics	2	2	0	2
	Total	**08**	**08**	**00**	**08**
SEMESTER - II					
203MBC21	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 Main (E-mail) – Intranet and Extranet.

Unit – V:

Descriptive statistics – tabulation, graphical representation – bar diagram – and pie diagrams – various measures of variance, measures of central tendency and normal distribution. Differential statistics "t" test, Chi – square test, "F" test (ANOVA) co -variance (ANCOVA) correlation and multiple regression analysis - Introduction to SPSS.

References:

- Thesis and Assignment writing by Janarthan Anderson and others – Wiley – Eastern Ltd, 1970. Part I Sections 1,2,3,4. Part II Sections 5,6,9,10.
- Research Methodology by C.R. Kothari, Chapter 1,2,3.
- Microsoft Office 2003 – Edward C. Willet. First Edition 2004, Wiley Publications, USA , (Chapters 2,3,4,5,6,12,14,15,26,28,29)

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 Imumunology- 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 nanobiotechnolgy; Nanoparticals; 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.

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.

PAPER III - MICROBIAL BIOTECHNOLOGY

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 tumorgenity in plants. Production of Biofertilizer

References:

1. Textbook of Microbiology - Ananthanarayanan and Jayaram panikar. Seventh Edition 2005
2. Microbiology - Pelczar, Chan and Krieg 5th 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.

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, braches.
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 resourse to check publisher copyright & self-archiving policies.
3. Software tool to ideitify 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 Metrices (3 hours)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP,Cite Score.
2. Metrices: h-index. g index, i10 index, altmetrics.