REGULATION

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THANJAVUR- 613 403 - TAMIL NADU

INDEX

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THANJAVUR – 613 403 - TAMILNADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

Program me Name &Code	Course Code	Title of the Course	Cross cutting Issues			
			Professional ethics	Gender Sensitization	Human Values	Environment and Sustainability
BTech(FT)-ECE-17UGECEFT	17147S11	Communicative English	✓	-	-	-
BTech(FT)-ECE	17148S12	Engineering Mathematics I	-	-	-	-
BTech(FT)-ECE	17149S13	Engineering Physics	-	-	-	-
BTech(FT)-ECE	17149S14	Engineering Chemistry	-	-	-	-
BTech(FT)-ECE	17154S15	Engineering Graphics	-	-	-	-
BTech(FT)-ECE	17150S16	Problem Solving and Python Programming	-	-	-	-
BTech(FT)-ECE	17150L17	Problem Solving and Python Programming Lab	-	-	-	-
BTech(FT)-ECE	17149L18	Physics and Chemistry Lab	-	-	-	-
BTech(FT)-ECE	171VEA19	Value Education	-	-	-	-
BTech(FT)-ECE	17147S21	Technical English	-	-	-	-
BTech(FT)-ECE	17148S22A	Engineering Mathematics II	-	-	-	-
BTech(FT)-ECE	17149S23B	Physics for Electronics Engineering	-	-	-	-
BTech(FT)-ECE	17152S24B	Circuit Analysis				

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

			-	-	-	-
BTech(FT)-ECE	17153S25B	Basic Electrical And Instrumentation Engineering	-	-	-	-
BTech(FT)-ECE	17152S26B	Electronic Devices	-	-	-	-
BTech(FT)-ECE	17154L27	Engineering Practices Lab	-	-	-	-
BTech(FT)-ECE	17152L28B	Circuits and Devices Lab	-	-	-	-
BTech(FT)-ECE	171ICA29	Fundamentals of Indian Constitution and Economy	✓	-	-	-
BTech(FT)-ECE	17148S31B	Linear Algebra and Partial Differential Equations	-	-	-	-
BTech(FT)-ECE	17152C32	Control Systems Engineering	-	-	-	-
BTech(FT)-ECE	17152C33	Fundamentals of Data Structures In C	-	-	-	-
BTech(FT)-ECE	17152C34	Digital Electronics	-	-	-	-
BTech(FT)-ECE	17152C35	Signals and Systems	-	-	-	-
BTech(FT)-ECE	17152C36	Electronic Circuits- I	-	-	-	-
BTech(FT)-ECE	17152L37	Fundamentals of Data Structures In C Laboratory	-	-	-	-
BTech(FT)-ECE	17152L38	Analog and Digital Circuits Laboratory	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY

Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

BTech(FT)-ECE	17152L39	Interpersonal Skills / Listening & Speaking	✓	-	-	-
BTech(FT)-ECE	17148S41B	Probability and Random Processes	-	-	-	-
BTech(FT)-ECE	17152C42	Electronic Circuits II	-	-	-	-
BTech(FT)-ECE	17152C43	Communication Theory	-	-	-	-
BTech(FT)-ECE	17152C44	Electromagnetic Fields	-	-	-	-
BTech(FT)-ECE	17152C45	Linear Integrated Circuits	-	-	-	-
BTech(FT)-ECE	17149S46	Environmental Science and Engineering	-	-	-	✓
BTech(FT)-ECE	17152L47	Circuits Design and Simulation Laboratory	-	-	-	-
BTech(FT)-ECE	17152L48	Linear Integrated Circuits Laboratory	-	-	-	-
BTech(FT)-ECE	17152CRS	Research Led Seminar	-	-	-	-
BTech(FT)-ECE	17152C51	Digital Communication	-	-	-	-
BTech(FT)-ECE	17152C52	Discrete-Time Signal Processing	-	-	-	-
BTech(FT)-ECE	17152C53	Computer Architecture and Organization	-	-	-	-
BTech(FT)-ECE	17152C55	Communication Networks	-	-	-	-
BTech(FT)-ECE	17152L57	Digital Signal Processing Laboratory	-	-	-	-

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NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

BTech(FT)-ECE	17152L58	Communication Systems Laboratory	-	-	-	-
BTech(FT)-ECE	17152L59	Communication Networks Laboratory	-	-	-	-
BTech(FT)-ECE	17152CRM	Research Methodology	-	-	-	-
BTech(FT)-ECE	17152C61	Microprocessors and Microcontrollers	-	-	-	-
BTech(FT)-ECE	17152C62	VLSI Design	-	-	-	-
BTech(FT)-ECE	17152C63	Wireless Communication	-	-	-	-
BTech(FT)-ECE	17152C64	Principles of Management	-	-	-	-
BTech(FT)-ECE	17152C65	Transmission Lines and RF Systems	-	-	-	-
BTech(FT)-ECE	17152L61	Microprocessors and Microcontrollers Laboratory	-	-	-	-
BTech(FT)-ECE	17152L62	VLSI Design Laboratory	-	-	-	-
BTech(FT)-ECE	17152L63	Professional Communication	✓	-	-	-
BTech(FT)-ECE	17152L64	Technical Seminar	-	-	-	-
BTech(FT)-ECE	17152CBR	Participation in Bounded Research	-	-	-	-
BTech(FT)-ECE	17152C71	Antennas and Microwave Engineering	-	-	-	-
BTech(FT)-ECE	17152C72	Optical Communication	-	-	-	-

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THANJAVUR – 613 403 - TAMILNADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

BTech(FT)-ECE	17152C73	Embedded and Real Time Systems	-	-	-	-
BTech(FT)-ECE	17152C75	Adhoc and Wireless Sensor Networks	-	-	-	-
BTech(FT)-ECE	17152L77	Embedded Laboratory	-	-	-	-
BTech(FT)-ECE	17152L78	Advanced Communication Laboratory	-	-	-	-
BTech(FT)-ECE	17152P83	Project Work	-	-	-	-
BTech(FT)-ECE	17152CEC	Comprehensive Exit Course	-	-	-	-
BTech(FT)-ECE	17152E56A	Object Oriented Programming	-	-	-	-
BTech(FT)-ECE	17152E56B	Medical Electronics	-	-	-	-
BTech(FT)-ECE	17152E56C	Operating Systems	-	-	-	-
BTech(FT)-ECE	17152E56D	Robotics and Automation	-	-	-	-
BTech(FT)-ECE	17152E56E	Nano Technology and Applications	-	-	-	-
BTech(FT)-ECE	17152E56F	Human Rights	-	-	-	-
BTech(FT)-ECE	17152E56G	Total Quality Management	✓			
BTech(FT)-ECE	17152E66A	Cryptography and Network Security	-	-	-	-
BTech(FT)-ECE	17152E66B	Advanced Digital Signal Processing	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

BTech(FT)-ECE	17152E66C	MEMS and NEMS	-	-	-	-
BTech(FT)-ECE	17152E66D	Multimedia Compression and Communication	-	-	-	-
BTech(FT)-ECE	17152E66E	CMOS Analog IC Design	-	-	-	-
BTech(FT)-ECE	17152E66F	Wireless Networks	-	-	-	-
BTech(FT)-ECE	17152E66G	Intellectual Property Rights	-	-	-	-
BTech(FT)-ECE	17152E76A	Advanced Wireless Communication	-	-	-	-
BTech(FT)-ECE	17152E76B	Cognitive Radio	-	-	-	-
BTech(FT)-ECE	17152E76C	Foundation Skills in Integrated Product Development	-	-	-	-
BTech(FT)-ECE	17152E76D	Machine Learning Techniques	-	-	-	-
BTech(FT)-ECE	17152E76E	Electronics Packaging and Testing	-	-	-	-
BTech(FT)-ECE	17152E76F	Mixed Signal IC Design	-	-	-	-
BTech(FT)-ECE	17152E76G	Disaster Management	✓			
BTech(FT)-ECE	17152E81A	Electro Magnetic Interference and Compatibility	-	-	-	-
BTech(FT)-ECE	17152E81B	Low Power SoC Design	-	-	-	-

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THANJAVUR – 613 403 - TAMILNADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

BTech(FT)-ECE	17152E81C	Photonic Networks	-	-	-	-
BTech(FT)-ECE	17152E81D	Compressive Sensing	-	-	-	-
BTech(FT)-ECE	17152E81E	Digital Image Processing	-	-	-	-
BTech(FT)-ECE	17152E81F	Professional Ethics in Engineering	✓	-	-	-
BTech(FT)-ECE	17152E82A	Video Analytics	-	-	-	-
BTech(FT)-ECE	17152E82B	DSP Architecture and Programming	-	-	-	-
BTech(FT)-ECE	17152E82C	Satellite Communication	-	-	-	-
BTech(FT)-ECE	17152E82D	Soft Computing	-	-	-	-
BTech(FT)-ECE	17152E82E	Principles of Speech Processing	-	-	-	-
BTech(FT)-ECE	17152E82F	Fundamentals of Nano Science	-	-	-	-
B-Tech(PT)-ECE-17UGECEPT	17148S11BP	Transforms and Partial Differential Equations	-	-	-	-
B	17152H12P	Electromagnetic Theory	-	-	-	-
B	17152H13P	Digital Electronics	-	-	-	-
B	17152H14P	Electronic Circuits - I	-	-	-	-
B	17152H15P	Signals and Systems	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY

Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

B	17148S21P	Numerical Methods	-	-	-	-
B	17152S22P	Electrical Engineering and Control Systems	-	-	-	-
B	17152H23P	Linear Integrated Circuits	-	-	-	-
B	17152H24P	Electronic Circuits - II	-	-	-	-
B	17152H25P	Transmission Lines and Waveguides	-	-	-	-
B	17148S31BP	Probability and Random Processes	-	-	-	-
B	17152H32P	Microprocessor Interfacing and Applications	-	-	-	-
B	17152H33P	Digital Signal Processing	-	-	-	-
B	17152H34P	Communication Theory	-	-	-	-
B	17152L35P	Digital Signal Processing and Microprocessor Lab	-	-	-	-
B	17152H41P	Digital Communication	-	-	-	-
B	17152H42P	Antenna and Wave Propagation	-	-	-	-
B	17152H43P	Computer Networks	-	-	-	-
B	17152E44AP	High Speed Networks	-	-	-	-
B	17152E44BP	Advanced Digital Signal	-	-	-	-

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Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

		Processing				
B	17152E44CP	Speech Processing	-	-	-	-
B	17152E44DP	Fuzzy Logic and Neural Networks	-	-	-	-
B	17152E44EP	Advanced Electronic System Design	-	-	-	-
B	17152L45P	Networks and Communication Lab	-	-	-	-
B	17152H51P	Optical Communication and Networks	-	-	-	-
B	17152H52P	Microwave Engineering	-	-	-	-
B	17152H53P	VLSI Design	-	-	-	-
B	17149E54AP	Environmental Science and Engineering	-	-	-	✓
B	17152E54BP	Optoelectronic Devices	-	-	-	-
B	17152E54CP	Radar and Navigational Aids	-	-	-	-
B	17152E54DP	Digital Image Processing	-	-	-	-
B	17152E54EP	Engineering Acoustics	✓	-	-	-
B	17152L55P	Optical Communication and Microwave Lab	-	-	-	-
B	17152H61P	Mobile and Wireless Communication	-	-	-	-

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THANJAVUR – 613 403 - TAMIL NADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

B	17152H62P	Medical Electronics	-	-	-	-
B	17152H63P	Micro Controller and Embedded systems	-	-	-	-
B	17160E64AP	Principles Of Management	✓	-	-	-
B	17152E64BP	Satellite Communication	-	-	-	-
B	17152E64CP	Robotics	-	-	-	-
B	17152E64DP	Remote sensing	-	-	-	-
B	17150E64EP	Network Security	-	-	-	-
B	17152L65P	VLSI and Embedded systems Lab	-	-	-	-
B	17160S71P	Total Quality Management	✓	-	-	-
B	17152H72P	Wireless Networks	-	-	-	-
B	17152H73P	Telecommunication Switching and Networks	-	-	-	-
B	17152E74AP	Power Electronics	-	-	-	-
B	17152E74BP	Advanced Microprocessors	-	-	-	-
B	17152E74CP	Electromagnetic Interference and Compatibility	-	-	-	-
B	17152E74DP	Solid State Electronic				

				Drives	-	-	-	-
B			17152E74EP	Computer Hardware and Interfacing	-	-	-	-
B			17152P75P	Project Work & Viva Voce	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17248S11B	**Applied mathematics for Electronics Engineering**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H12	**Statistical Signal Processing**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H13	**Modern Digital CommunicationSystems**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271S14	**CommunicationProtocol Engineering**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H15	**AdvancedRadiation Systems**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271L17	**CommunicationSystems Lab - I**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271CRS	**ResearchLedSeminar**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H21	**MobileCommunication Networks**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H22	**AdvancedMicrowave Systems**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H23	**FiberOpticNetworking**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H21	**MobileCommunication Networks**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H22	**AdvancedMicrowave Systems**	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H23	**FiberOpticNetworking**	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

MTech(FT)	ECE	17PGECEFT	17271CRM	ResearchMethodology	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271CBR	ParticipationinBounded Research	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271H31	WirelessSensorNetworks	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271P35	ProjectPhase–I	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271CSR	ScaffoldedResearch	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271P41	ProjectPhase–II	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E16A	Internetworkingand Multimedia	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E16B	DigitalImage Processing	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E16C	LASERCommunication	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E24A	HighSpeedSwitching Architecture	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E24B	DSP Processor Architectureand Programming	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E24C	DigitalSpeech Processing	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E25A	DigitalCommunication Receivers	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E25B	SoftComputing	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E25C	Communication NetworkSecurity	-	-	-	-
MTech(FT)	ECE	17PGECEFT	17271E32A	SoftwareDefined Radio				

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THANJAVUR – 613 403 - TAMIL NADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

			-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E32B	Satellite Communication	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E32C	CDMASystems	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E33A	WaveletsandMulti Resolution Processing	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E33B	Highperformance Communication Networks	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E33C	Advanced Microprocessorsand Microcontrollers	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E34A	Simulation of Communication Networks	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E34B	Medical Imaging	-	-	-	-
MTech(FT) ECE 17PGECEFT	17271E34C	MobileADHOC networks	-	-	-	-
MTech(PT) ECE 17PGECEPT	17248S11BP	Appliedmathematics for Electronics Engineering	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271H12P	StatisticalSignal Processing	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271H13P	ModernDigital Communication Systems	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271L14P	Communication SystemsLab -I	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271CRSP	ResearchLedSeminar	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271H21P	MobileCommunication Networks	-	-	-	-
MTech(PT) ECE 17PGECEPT	17271H22P	AdvancedMicrowave Systems				

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THANJAVUR – 613 403 - TAMIL NADU

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

					-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271L24P	Communication SystemsLab-II	-	-	-	-
MTech(PT)	ECE	17PGECEPT	172TECWRP	TechnicalWriting /Seminars	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271CRMP	ResearchMethodology	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271CBRP	Participationin BoundedResearch	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271H31P	Communication Protocol Engineering	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271H32P	AdvancedRadiation Systems	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271CSRP	Scaffolded Research	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271H41P	WirelessSensor Networks	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271H42P	FiberOpticNetworking	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271P44P	ProjectPhase–I	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271P61P	ProjectPhase–II	-	-	-	-
MTech(PT)	ECE	17PGECEPT	1727E23AP	HighSpeedSwitching Architecture	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E23BP	DSPProcessor Architectureand Programming	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E23CP	DigitalSpeech Processing	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E33AP	Internetworkingand Multimedia	-	-	-	-

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

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 17 REGULATION -Mapping of cross cutting issues

MTech(PT)	ECE	17PGECEPT	17271E33BP	DigitalImage Processing	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E33CP	LASERCommunication	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E43AP	DigitalCommunication Receivers	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E43BP	SoftComputing	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E43CP	Communication NetworkSecurity	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E51AP	SoftwareDefined Radio	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E51BP	Satellite Communication	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E51CP	CDMASystems	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E52AP	WaveletsandMulti Resolution Processing	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E52BP	Highperformance Communication Networks	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E52CP	Advanced Microprocessorsand Microcontrollers	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E53AP	Simulationof Communication Networks	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E53BP	Medical Imaging	-	-	-	-
MTech(PT)	ECE	17PGECEPT	17271E53CP	MobileADHOC networks	-	-	-	-

1.3.1SUPPORTINGDOCUMENTS

Courses (offered in 2018-19) which address the Gender Sensitization, Human Values, Professional Ethics, Environment and sustainability.

SCHOOLOFENGINEERINGANDTECHNOLOGY

DEPARTMENTOFELECTRONICSANDCOMMUNICATION ENGINEERING

Gender Sensitization and Human Values	
Professional Ethics	
Human Values	
Environment and sustainability	
Professional Ethics & Human Values	

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Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

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:

Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

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.

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.

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.

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.

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.

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.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

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.

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.

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

I - VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER I

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17147S11	Communicative English	5	1	0	4
2.	17148S12	Engineering Mathematics I	5	1	0	4
3.	17149S13	Engineering Physics	5	1	0	4
4.	17149S14	Engineering Chemistry	5	1	0	4
5.	17154S15	Engineering Graphics	5	1	0	4
6.	17150S16	Problem Solving and Python Programming	5	1	0	4
PRACTICALS						
7.	17150L17	Problem Solving and Python Programming Lab	0	0	3	2
8.	17149L18	Physics and Chemistry Lab	0	0	3	2
9.	171VEA19	Value Education				1
		TOTAL	**30**	**6**	**6**	**29**

SEMESTER II

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17147S21	Technical English	5	1	0	4
2.	17148S22A	Engineering Mathematics II	5	1	0	4
3.	17149S23B	Physics for Electronics Engineering	5	1	0	4
4.	17152S24B	Circuit Analysis	5	1	0	4
5.	17153S25B	Basic Electrical And Instrumentation Engineering	5	1	0	4
6.	17152S26B	Electronic Devices	5	1	0	4
PRACTICALS						
7.	17154L27	Engineering Practices Lab	0	0	3	2
8.	17152L28B	Circuits and Devices Lab	0	0	3	2
9.	171ICA29	Fundamentals of Indian Constitution and Economy				1
		TOTAL	**30**	**6**	**6**	**29**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17148S31B	Linear Algebra and Partial Differential Equations	4	0	0	4
2.	17152C32	Control Systems Engineering	3	0	0	3
3.	17152C33	Fundamentals of Data Structures In C	3	0	0	3
4.	17152C34	Digital Electronics	3	0	0	3
5.	17152C35	Signals and Systems	4	0	0	4
6.	17152C36	Electronic Circuits- I	3	0	0	3
PRACTICALS						
7.	17152L37	Fundamentals of Data Structures In C Laboratory	0	0	3	2
8.	17152L38	Analog and Digital Circuits Laboratory	0	0	3	2
9.	17152L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
		TOTAL	**20**	**0**	**8**	**25**

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17148S41B	Probability and Random Processes	4	0	0	4
2.	17152C42	Electronic Circuits II	3	0	0	3
3.	17152C43	Communication Theory	3	0	0	3

4.	17152C44	Electromagnetic Fields	4	0	0	4
5.	17152C45	Linear Integrated Circuits	3	0	0	3
6.	17149S46	Environmental Science and Engineering	3	0	0	3
PRACTICALS						
7.	17152L47	Circuits Design and Simulation Laboratory	0	0	3	2
8.	17152L48	Linear Integrated Circuits Laboratory	0	0	3	2
Research Skill Development (RSD) Course						
9.	17152CRS	Research Led Seminar				1
		TOTAL	**21**	**0**	**6**	**25**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17152C51	Digital Communication	3	0	0	3
2.	17152C52	Discrete-Time Signal Processing	4	0	0	4
3.	17152C53	Computer Architecture and Organization	3	0	0	3
4.	**171__FE54_**	**Free Elective - I**	3	0	0	3
5.	17152C55	Communication Networks	3	0	0	3
6.	**17152E56_**	**Elective - I**	3	0	0	3
PRACTICALS						
7.	17152L57	Digital Signal Processing Laboratory	0	0	3	2
8.	17152L58	Communication Systems Laboratory	0	0	3	2
9.	17152L59	Communication Networks Laboratory	0	0	3	2
Research Skill Development (RSD) Course						
10.	17152CRM	Research Methodology	3	0	0	3
		TOTAL	**22**	**0**	**9**	**28**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17152C61	Microprocessors and Microcontrollers	3	0	0	3
2.	17152C62	VLSI Design	3	0	0	3
3.	17152C63	Wireless Communication	3	0	0	3
4.	17152C64	Principles of Management	3	0	0	3
5.	17152C65	Transmission Lines and RF Systems	3	0	0	3
6.	**17152E66_**	**Elective - II**	3	0	0	3
PRACTICALS						
7.	17152L61	Microprocessors and Microcontrollers Laboratory	0	0	3	2
8.	17152L62	VLSI Design Laboratory	0	0	3	2
9.	17152L63	Professional Communication	0	0	2	1
10.	17152L64	Technical Seminar	0	0	2	1
Research Skill Development (RSD) Course						
11.	17152CBR	Participation in Bounded Research				2
		TOTAL	**20**	**0**	**10**	**26**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17152C71	Antennas and Microwave Engineering	3	0	0	3
2.	17152C72	Optical Communication	3	0	0	3
3.	17152C73	Embedded and Real Time Systems	3	0	0	3
4.	**171__FE74_**	**Free Elective - II**	3	0	0	3
5.	17152C75	Adhoc and Wireless Sensor Networks	3	0	0	3
6.	**17152E76_**	**Elective - III**	3	0	0	3
PRACTICALS						
7.	17152L77	Embedded Laboratory	0	0	3	2
8.	17152L78	Advanced Communication Laboratory	0	0	3	2

Research Skill Development (RSD) Course						
9.	17152CSR	Design/Socio-Technical Project				4
		TOTAL	**18**	**0**	**10**	**26**

SEMESTER VIII

Sl. No	**COURSE CODE**	**COURSE TITLE**	**L**	**T**	**P**	**C**
THEORY						
1.	**17152E81_**	**Elective – IV**	3	0	0	3
2.	**17152E82_**	**Elective – V**	3	0	0	3
PRACTICALS						
3.	17152P83	Project Work	0	0	20	10
4.	17152CEC	Comprehensive Exit Course	0	0	0	2
		TOTAL	**6**	**0**	**20**	**18**
		TOTAL NO. OF CREDITS:				**206**

LIST OF ELECTIVES

ELECTIVE - I (SEMESTER V)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17152E56A	Object Oriented Programming	3	0	0	3
2.	17152E56B	Medical Electronics	3	0	0	3
3.	17152E56C	Operating Systems	3	0	0	3
4.	17152E56D	Robotics and Automation	3	0	0	3
5.	17152E56E	Nano Technology and Applications	3	0	0	3
6.	17152E56F	Human Rights	3	0	0	3
7.	17152E56G	Total Quality Management	3	0	0	3

ELECTIVE – II (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17152E66A	Cryptography and Network Security	3	0	0	3
2.	17152E66B	Advanced Digital Signal Processing	3	0	0	3
3.	17152E66C	MEMS and NEMS	3	0	0	3
4.	17152E66D	Multimedia Compression and Communication	3	0	0	3
5.	17152E66E	CMOS Analog IC Design	3	0	0	3
6.	17152E66F	Wireless Networks	3	0	0	3
7.	17152E66G	Intellectual Property Rights	3	0	0	3

ELECTIVE – III (SEMESTER VII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17152E76A	Advanced Wireless Communication	3	0	0	3
2.	17152E76B	Cognitive Radio	3	0	0	3
3.	17152E76C	Foundation Skills in Integrated Product Development	3	0	0	3
4.	17152E76D	Machine Learning Techniques	3	0	0	3
5.	17152E76E	Electronics Packaging and Testing	3	0	0	3
6.	17152E76F	Mixed Signal IC Design	3	0	0	3
7.	17152E76G	Disaster Management	3	0	0	3

ELECTIVE – IV (SEMESTER VIII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17152E81A	Electro Magnetic Interference and Compatibility	3	0	0	3
2.	17152E81B	Low Power SoC Design	3	0	0	3
3.	17152E81C	Photonic Networks	3	0	0	3
4.	17152E81D	Compressive Sensing	3	0	0	3
5.	17152E81E	Digital Image Processing	3	0	0	3
6.	17152E81F	Professional Ethics in Engineering	3	0	0	3

ELECTIVE - V (SEMESTER VIII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17152E82A	Video Analytics	3	0	0	3
2.	17152E82B	DSP Architecture and Programming	3	0	0	3
3.	17152E82C	Satellite Communication	3	0	0	3
4.	17152E82D	Soft Computing	3	0	0	3
5.	17152E82E	Principles of Speech Processing	3	0	0	3
6.	17152E82F	Fundamentals of Nano Science	3	0	0	3

LIST OF FREE ELECTIVES

FREE ELECTIVE – I (SEMESTER V)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	17150FE54A	Database Management Systems	3	0	0	3
2.		17150FE54B	Cloud Computing	3	0	0	3
3.	EEE	17153FE54A	Industrial Nano Technology	3	0	0	3
4.		17153FE54B	Energy Conservation and Management	3	0	0	3
5.	MECH	17154FE54A	Renewable Energy Sources	3	0	0	3
6.		17154FE54B	Automotive Systems	3	0	0	3
7.	CIVIL	17155FE54A	Air Pollution and Control Engineering	3	0	0	3
8.		17155FE54B	Geographic Information System	3	0	0	3

FREE ELECTIVE – II (SEMESTER VII)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	17150FE74A	Introduction to C Programming	3	0	0	3
2.		17150FE74B	Data Structures and Algorithms	3	0	0	3
3.	EEE	17153FE74A	Basic Circuit Theory	3	0	0	3
4.		17153FE74B	Introduction to Renewable Energy Systems	3	0	0	3
5.	MECH	17154FE74A	Industrial Safety	3	0	0	3
6.		17154FE74B	Testing of Materials	3	0	0	3
7.	CIVIL	17155FE74A	Green Building Design	3	0	0	3
8.		17155FE74B	Waste Water Treatment	3	0	0	3

B.TECH (FULL TIME) - ECE

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Semester	Core	Elective	Practical	Others	CEC	Project	RSD Course	Total
I	24	-	04	01	-	-	-	**29**
II	24	-	04	01	-	-	-	**29**
III	20	-	05	-	-	-	-	**25**
IV	20	-	04	-	-	-	**01**	**25**
V	13	06	06	-	-	-	**03**	**28**
VI	15	03	05	01	-	-	**02**	**26**
VII	12	06	04	-	-	-	**04**	**26**
VIII	-	06	-	-	2	10	-	**18**
TOTAL CGPA CREDITS								**206**

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	**206**
NON-CGPA CREDITS	**05**
TOTAL	**211**

17147S11 COMMUNICATIVE ENGLISH L T P C

5 1 0 4

OBJECTIVES:

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

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

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

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing –** paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening-** telephonic conversations. **Speaking –** sharing information of a personal kind—greeting – taking leave-**Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure-use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking-** asking about routine actions and expressing opinions. **Language development-** degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development –** single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing-** letter writing, informal or personal letters-e-mails-conventions of personal email-**Listening-** listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-**Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development-** synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

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

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.

7148S12	**ENGINEERING MATHEMATICS I**	**L**	**T**	**P**	**C**
		5	**1**	**0**	**4**

OBJECTIVES:

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

UNIT I DIFFERENTIAL CALCULUS 12

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

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

UNIT III INTEGRAL CALCULUS 12

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

UNIT IV MULTIPLE INTEGRALS 12

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

UNIT V DIFFERENTIAL EQUATIONS 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

TEXT BOOKS :

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

REFERENCES :

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

17149S13	ENGINEERING PHYSICS	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I PROPERTIES OF MATTER 9

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

UNIT II WAVES AND FIBER OPTICS 9

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

UNIT III THERMAL PHYSICS 9

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

UNIT IV QUANTUM PHYSICS 9

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

UNIT V CRYSTAL PHYSICS 9

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

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course,

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

TEXT BOOKS:

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

REFERENCES:

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

17149S14 ENGINEERING CHEMISTRY

L	T	P	C
5	1	0	4

OBJECTIVES:

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

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

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

UNIT III ALLOYS AND PHASE RULE 9

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

UNIT IV FUELS AND COMBUSTION 9

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

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

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

17154S15 ENGINEERING GRAPHICS

L	T	P	C
5	1	0	4

OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (Not for Examination) 1

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

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

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

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

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

UNIT III PROJECTION OF SOLIDS 5+12

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

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

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

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

TOTAL: 90 PERIODS

OUTCOMES:

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

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

TEXT 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.

17150S16 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.

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.

17150L17 PROBLEM SOLVING ANDPYTHON PROGRAMMING LAB

L	T	P	C
0	0	3	2

OBJECTIVES

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

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. 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

17149L18 PHYSICS AND CHEMISTRY LAB

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
   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)

171VEA19	VALUE EDUCATION	L	T	P	C
		0	0	0	1

OBJECTIVES

- To teach the philosophy of Life, personal value, social value, mind cultural value and personal health
- To teach and inculcate the importance of value based living.
- To teach professional ethical values, codes of ethics, responsibilities, safety, rights and related global issues.
- To give students a deeper understanding about the purpose of life.
- To teach the significance of being responsible citizens of the society.

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

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

Personal Development:

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

Character Formation Towards Positive Personality:

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

UNIT – II Constitutional, Social and Professional Values

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

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

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

UNIT – III Religious, Aesthetic Values and National Integration

Religious Values - Tolerance, wisdom, character.

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

National Integration and International understanding.

UNIT – IV Impact of Global Development on Ethics and Values

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

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

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

UNIT – V Theraupatic Measures

Control of the mind through

a. Simplified physical exercise

b. Meditation – Objectives, types, effect on body, mind and soul

c. Yoga – Objectives, Types, Asanas

d. Activities:

(i) Moralisation of Desires

(ii) Neutralisation of Anger

(iii) Eradication of Worries

(iv) Benefits of Blessings

COURSE OUTCOMES

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

- To learn about philosophy of Life and Individual qualities
- To learn and practice social values and responsibilities
- To learn and practice mind culture, forces acting on the body
- To learn more of Responsibilities and Rights as Professional and facing Global Challenges
- Emerge as responsible citizen with clear conviction to be a role-model in the society.

References:

1. Gawande.EN – “Value Oriented Education” – Vision for better living, New Delhi (2002) Saruptsons.
2. Brain Trust Aliyar – “Value Education for health, happiness and harmony” Erode (2008), Vethathiri publications.
3. Ignacimuthu S.J.S. – “Values for life” Bombay (1999).
4. Yogesh Kumar Singh and Ruchika Nath – “Value Education” New Delhi (2005) A.P.H Publishing Corporation.
5. Ruhela S.P – “Human Value and Education” New Delhi – Sterling publishers.

17147S21 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:

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.

17148S22A **ENGINEERING MATHEMATICS – II**

L	T	P	C
5	1	0	4

OBJECTIVES :

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

UNIT I MATRICES 12

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

UNIT II VECTOR CALCULUS 12

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

UNIT III ANALYTIC FUNCTIONS 12

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions w □ z □ 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.

17149S23B PHYSICS FOR ELECTRONICS ENGINEERING **L T P C**
(Common to BME, ME, CC, ECE, EEE, E&I, ICE) **5 1 0 4**

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

17152S24B **CIRCUIT ANALYSIS**

L	T	P	C
5	1	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.

17153S25B BASIC ELECTRICAL AND INSTRUMENTATION ENGINEERING

L	T	P	C
5	1	0	4

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

17152S26B **ELECTRONIC DEVICES** **L T P C**
5 1 0 4

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.

17154L27 ENGINEERING PRACTICES LAB

L T P C
0 0 3 2

OBJECTIVES:

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

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

Buildings:

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.

17152L28B **CIRCUITS AND DEVICES LAB** **L T P C**
0 0 3 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

171ICA29 **FUNDAMENTALS OF INDIAN CONSTITUTION AND ECONOMY**

L T P C
0 0 0 1

COURSE OBJECTIVES:

- To Enable the student to understand the importance of constitution
- To understand philosophy of fundamental rights and duties
- To understand the autonomous nature of constitutional bodies like Supreme Court and high court, controller and auditor general of India and election commission of India.
- To understand the central and state relation, financial and administrative.

Unit-I: The Making Of Indian Constitution
The Constituent Assembly: Organization- Character- Work-Salient feature of the constitution- Written and detailed constitution- Socialism- Secularism- Democracy and Republic.

Unit-II: Fundamental Rights And Fundamental Duties Of The Citizens
Right of equality- Right of freedom-Right against exploitation-Right to freedom of religion- Cultural and Educational rights-Right to constitutional remedies- Fundamental duties.

Unit-III: Directive Principles Of State Policy
Socialistic principles- Gandhian principles- Liberal and general principles-Differences between Fundamental Rights and Directive principles

Unit-IV: The Union Executive, Union Parliament And Supreme Court
Powers and Positions of the president- Qualification-Method of election of president and Vice President-Prime minister- Rajya sabha- Lok sabha- The Supreme Court- High Court- Functions and Positions of Supreme Court and High Court.

Unit V: State Council- Election System And Parlimentary Democracy In India
State Council of Ministers- Chief Minister- Election Systems in India- Main Features-Election Commission –Features of Indian Democracy.

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

- Understand the emergence and evolution of Indian Constitution.
- Understand the structure and composition of Indian Constitution
- Understand and analyse federalism in the Indian context.
- Understand and analyse the three organs of the state in the contemporary scenario.
- Understand and Evaluate the Indian Political scenario amidst the emerging challenges.

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.

17148S31B 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.

17152C32 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, 5 th 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.

17152C33 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.

17152C34 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.

17152C35 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.

17152C36 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.

17152L37 FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY

L T P C
0 0 3 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

17152L38 ANALOG AND DIGITAL CIRCUITS LABORATORY

L	T	P	C
0	0	3	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.

17152L39 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

17148S41B 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.

17152C42 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.

17152C43 **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.

17152C44 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

17152C45 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,5^{th} Edition, 2009.
5. William D.Stanley, ―Operational Amplifiers with Linear Integrated Circuits‖, Pearson Education,4^{th} Edition,2001.
6. S.Salivahanan & V.S. Kanchana Bhaskaran, ―Linear Integrated Circuits‖, TMH,2^{nd} Edition, 4^{th} Reprint, 2016.

17149S46 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.

17152L47	CIRCUITS DESIGN AND SIMULATION LABORATORY	L	T	P	C
		0	0	3	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.

17152L48	LINEAR INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	3	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.

17152C51 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.

17152C52 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.

17152C53 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.

17152C55 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.

17152L57 DIGITAL SIGNAL PROCESSING LABORATORY

L	T	P	C
0	0	3	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

17152L58 COMMUNICATION SYSTEMS LABORATORY

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

17152L59 COMMUNICATION NETWORKS LABORATORY

L	T	P	C
0	0	3	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.

17152CRM 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.

17152C61 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

17152C62 **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.

17152C63 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.

17152C64 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

17152C65 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.

17152L61 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

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

17152L62 VLSI DESIGN LABORATORY

L	T	P	C
0	0	3	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.

Requirements:
Xilinx ISE/Altera Quartus/ equivalent EDA Tools along with Xilinx/Altera/equivalent FPGA Boards

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.

Requirements:
Cadence/Synopsis/ Mentor Graphics/Tanner/equivalent EDA Tools

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

17152L63 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.

17152C71 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

17152C72 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.

17152C73 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.

17152C75 AD HOC 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.

17152L77	EMBEDDED LABORATORY	L	T	P	C
		0	0	3	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

17152L78 ADVANCED COMMUNICATION LABORATORY

	L	T	P	C
	0	0	3	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 – I (SEMESTER V)

ELECTIVE – I

17152E56A 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

17152E56B 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.

17152E56C 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.

17152E56D 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

17152E56E NANOTECHNOLOGY 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.

17152E56F **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.

17152E56G 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

ELECTIVE – II

17152E66A 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

17152E66B 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

17152E66C 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

ELECTIVE – II

17152E66D 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

17152E66E **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

17152E66F **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

17152E66G 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.

ELECTIVE – III

17152E76A 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

17152E76B 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

17152E76C 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

ELECTIVE – III

17152E76D **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.

17152E76E 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

17152E76F 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

17152E76G 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.

17152E81A ELECTROMAGNETIC 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

17152E81B 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

17152E81C 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

17152E81D 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

17152E81E 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.

17152E81F **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

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

17152E82A 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

17152E82B 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.

17152E82C 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.

17152E82D 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

17152E82E 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

17152E82F 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, TiO_2,MgO, ZrO_2, NiO, Nano alumina, CaO, $AgTiO_2$, 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.

LIST OF FREE ELECTIVES

FREE ELECTIVE – I (SEMESTER V)

FREE ELECTIVE – I

17150FE54A 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.

FREE ELECTIVE – I

17150FE54B **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.

FREE ELECTIVE – I

17153FE54A **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 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)

FREE ELECTIVE – I

17153FE54B 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.

FREE ELECTIVE – I

17154FE54A 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.

FREE ELECTIVE – I

17154FE54B 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.

17155FE54A 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.

17155FE54B 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

LIST OF FREE ELECTIVES

FREE ELECTIVE – II (SEMESTER VII)

FREE ELECTIVE – II

17150FE74A 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.

FREE ELECTIVE – II

17150FE74B 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. Yashvant Kanetkar, "Data Structures Through C", BPB publications, II edition, 2003

17153FE74A 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.

17153FE74A 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.

FREE ELECTIVE – II

17154FE74A **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.

FREE ELECTIVE – II

17154FE74B 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.

FREE ELECTIVE – II

17155FE74A 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.

FREE ELECTIVE – II

17155FE74B **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.

PRIST UNIVERSITY
VALLAM, THANJAVUR

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

B.TECH ECE(PART-TIME)

[REGULATION 2017]
[for candidates admitted to B.Tech (Part Time) ECE program from June 2017 onwards]

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY

PRIST UNIVERSITY

(Under Section 3 of UGC Act 1956)

ISO9001:2008 CERTIFIED

VALLAM, THANJAVUR.

SCHOOL OF ENGINEERING AND TECHNOLOGY

(Department of Electronics & Communication Engineering)

PROGRAM EDUCATIONAL OBJECTIVES AND OUTCOMES

The department of ECE prepares young leaders working in a highly dynamic and global environment at the forefront of Engineering and pursues research to advance the state-of-the-art in Electrical and Computer Engineering and Engineering Education.

PROGRAM EDUCATIONAL OBJECTIVES:

Our alumni will:

1. continue as valued, dependable, and competent employees in a wide variety of fields
   and industries, in particular as electrical/computer engineers,
2. succeed in graduate and professional studies, such as engineering, science, or business.
3. pursue life-long learning and professional development for a successful and rewarding career.
4. provide leadership in their profession, in their communities, and in the global society,
   and
5. function as responsible members of society with an awareness of the social and ethical ramifications of their work.

PROGRAM OUTCOMES:

At graduation, our students will have:

1. the ability to apply knowledge of mathematics, science, and engineering
2. the ability to design and conduct experiments, as well as to analyze and interpret data
3. the ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. the ability to function on multi-disciplinary teams
5. the ability to identify, formulate, and solve engineering problems
6. the understanding of professional and ethical responsibility
7. the ability to communicate effectively
8. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
9. a recognition of the need for, and an ability to engage in life-long learning
10. a knowledge of contemporary issues
11. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MAPPING BETWEEN PEOS & POS:

PO/PEO	1	2	3	4	5	6	7	8	9	10	11
1	√	√		√	√						
2			√					√			
3							√				√
4									√	√	
5						√					

SEMESTER-I

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17148S11P	Transforms and Partial Differential Equations	4	1	0	4
2	17152H12P	Electromagnetic Theory	4	1	0	4
3	17152H13P	Digital Electronics	4	1	0	4
4	17152H14P	Electronic Circuits - I	4	1	0	3
5	17152H15P	Signals and Systems	4	1	0	4
TOTAL CREDITS						**19**

SEMESTER-II

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17148S21P	Numerical Methods	4	1	0	4
2	17153S22P	Electrical Engineering and Control Systems	4	1	0	4
3	17152H23P	Linear Integrated Circuits	4	1	0	4
4	17152H24P	Electronic Circuits - II	4	1	0	3
5	17152H25P	Transmission Lines and Waveguides	4	1	0	4
TOTAL CREDITS						**19**

SEMESTER-III

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1.	17148S31P	Probability and Random Processes	4	1	0	4
2.	17152H32P	Microprocessor Interfacing and Applications	4	1	0	4
3.	17152H33P	Digital Signal Processing	4	1	0	4
4.	17152H34P	Communication Theory	4	1	0	4
5.	17152L35P	Digital signal processing and Micro processor Lab	0	0	3	2
TOTAL CREDITS						**18**

SEMESTER-IV

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17152H41P	Digital Communication	4	1	0	4
2	17152H42P	Antenna and Wave Propagation	4	1	0	4
3	17152H43P	Computer Networks	4	0	0	4
4	171__E44_P	**Elective-I**	4	0	0	4
5	17152L45P	Networks and Communication Lab	0	0	3	2
TOTAL CREDITS						**18**

SEMESTER-V

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17152H51P	Optical Communication and Networks	**4**	**0**	**0**	**4**
2	17152H52P	Microwave Engineering	**4**	**0**	**0**	**4**
3	17152H53P	VLSI Design	**4**	**1**	**0**	**4**
4	171__E54_P	**Elective II**	**4**	**1**	**0**	**4**
5	17152L55P	Optical communication and Microwave Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-VI

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17152H61P	Mobile and Wireless Communication	**4**	**0**	**0**	**4**
2	17152H62P	Medical Electronics	**4**	**1**	**0**	**4**
3	17152H63P	Micro Controller and Embedded systems	**4**	**1**	**0**	**4**
4	171__E64_P	**Elective III**	**4**	**0**	**0**	**4**
5	17152L65P	VLSI and Embedded systems Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-VII

S.NO	SUB CODE	SUBJECT NAME	L	T	P	C
1	17160S71P	Total Quality Management	**4**	**0**	**0**	**3**
2	17152H72P	Wireless Networks	**4**	**1**	**0**	**4**
3	17152H73P	Telecommunication Switching and Networks	**4**	**0**	**0**	**4**
4	171__E74_P	**Elective IV**	**4**	**0**	**0**	**3**
5	17152P75P	Project Work & Viva Voce	**0**	**0**	**12**	**6**
TOTAL CREDITS						**20**

ELECTIVES-I (SEMESTER-IV)

S.No	Sub Code	Sub Name	L	T	P	C
1	17152E44AP	High Speed Networks	**4**	**0**	**0**	**4**
2	17152E44BP	Advanced Digital Signal Processing	**4**	**0**	**0**	**4**
3	17152E44CP	Speech Processing	**4**	**0**	**0**	**4**
4	17152E44DP	Fuzzy Logic and Neural Networks	**4**	**0**	**0**	**4**
5	17152E44EP	Advanced Electronic System Design	**4**	**0**	**0**	**4**

ELECTIVES-II (SEMESTER-V)

S.No	Sub Code	Sub Name	L	T	P	C
1	1758E54AP	Environmental Science and Engineering	**4**	**0**	**0**	**4**
2	17152E54BP	Optoelectronic Devices	**4**	**0**	**0**	**4**
3	17152E54CP	Radar and Navigational Aids	**4**	**0**	**0**	**4**
4	17152E54DP	Digital Image Processing	**4**	**0**	**0**	**4**
5.	17152E54EP	Engineering Acoustics	**4**	**0**	**0**	**4**

ELECTIVES-III(SEMESTER-VI)

S.No	Sub Code	Sub Name	L	T	P	C
1	17160E64AP	Principles Of Management	**4**	**0**	**0**	**4**
2	17152E64BP	Satellite Communication	**4**	**0**	**0**	**4**
3	17152E64CP	Robotics	**4**	**0**	**0**	**4**
4	17152E64DP	Remote sensing	**4**	**0**	**0**	**4**
5.	17150E64EP	Network Security	**4**	**0**	**0**	**4**

ELECTIVES-IV(SEMESTER-VII)

S.No	Sub Code	Sub Name	L	T	P	C
1	17152E74AP	Power Electronics	**4**	**0**	**0**	**3**
2	17152E74BP	Advanced Microprocessors	**4**	**0**	**0**	**3**
3	17152E74CP	Electromagnetic Interference and Compatibility	**4**	**0**	**0**	**3**
4	17152E74DP	Solid State Electronic Drives	**4**	**0**	**0**	**3**
5	17152E74EP	Computer Hardware and Interfacing	**4**	**0**	**0**	**3**

HOD **DEAN**

TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS 4 1 0 4

(Common to CSE, IT, ECE)

AIM

The course aims to develop the skills of the students in the areas of boundary value problems and transform techniques. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for post graduate and specialized studies and research.

OBJECTIVES

At the end of the course the students would

- Be capable of mathematically formulating certain practical problems in terms of partial differential equations, solve them and physically interpret the results.
- Have gained a well founded knowledge of Fourier series, their different possible forms and the frequently needed practical harmonic analysis that an engineer may have to make from discrete data.
- Have obtained capacity to formulate and identify certain boundary value problems encountered in engineering practices, decide on applicability of the Fourier series method of solution, solve them and interpret the results.
- Have grasped the concept of expression of a function, under certain conditions, as a double integral leading to identification of transform pair, and specialization on Fourier transform pair, their properties, the possible special cases with attention to their applications.

UNIT I FOURIER SERIES 9

Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9

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

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS 9

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z - transform.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9

Solution of First order partial differential equation reducible to standard forms – Lagrange's linear equation – Linear partial differential equations of second order and higher order with constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS 9

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

TUTORIAL :15 TOTAL: 60

TEXT BOOKS

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied Mathematicians", Macmillen , New York ,1988.
2. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCES

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

17152H12P **SEMESTER I**

ELECTROMAGNETIC THEORY

4-1-0-4

AIM

To familiarize the student to the concepts, calculations and pertaining to electric, magnetic and electromagnetic fields so that an in depth understanding of antennas, electronic devices, Waveguides is possible.

OBJECTIVES

- To analyze fields a potentials due to static changes
- To evaluate static magnetic fields
- To understand how materials affect electric and magnetic fields
- To understand the relation between the fields under time varying situations
- To understand principles of propagation of uniform plane waves.

UNIT I STATIC ELECTRIC FIELDS 9

Vector field. Introduction to Co-ordinate System – Rectangular – Cylindrical and Spherical Co-ordinate System –calculation of length area and volume. Definition of Curl, Divergence and Gradient – Meaning of Strokes theorem and Divergence theorem .

Coulomb's Law– Definition of Electric Field Intensity –Electric Field due to discrete charges – charges distributed uniformly on an infinite line –
Electric Scalar Potential – Relationship between potential and electric field - Potential due to infinite uniformly charged line –Electric Flux Density – Gauss Law – Proof of Gauss Law.

UNIT II STATIC MAGNETIC FIELD 9

The Biot-Savart Law in vector form –Magnetic field and Magnetic flux density- Magnetic Field intensity due to a infinite wire carrying a current I – Magnetic field intensity on the axis of a circular and rectangular loop carrying a current I –Calculation of field using Ampere's circuital law for symmetrical distributions a) infinitely long solenoid and b) coaxial cable. The Lorentz force equation for a moving charge and applications –Scalar and Vector Magnetic Potential.

UNIT III ELECTRIC AND MAGNETIC FIELDS IN MATERIALS 9

Poisson's and Laplace's equation – Electric Polarization- Definition of Capacitance – Capacitance of various geometries using Laplace's equation – Electrostatic energy and energy density – Boundary conditions for electric fields – Electric current – Current density – point form of ohm's law –

Definition of Inductance - Inductance of loops– Definition of mutual inductance. Energy density in magnetic fields – Nature of magnetic materials – magnetization and permeability - magnetic boundary conditions.

UNIT IV TIME VARYING ELECTRIC AND MAGNETIC FIELDS 9

Faraday's law – Displacement current – Generalization of Ampere's circuital law. Maxwell's Equation in integral form from Faraday's Law – Maxwell's Equation expressed in point form from Faraday's Law.
Poynting Vector Poynting Theorm and the flow of power – Power flow in a co-axial cable – Instantaneous Average and Complex Poynting Vector.

UNIT V ELECTROMAGNETIC WAVES 9
Derivation of Wave Equation –. Properties of Uniform Plane Wave — Wave equation for a conducting medium– Plane waves Propagation in good dielectrics ---- Plane waves Propagation in good conductors – Skin effect.

Linear, Elliptical and circular polarization –normal incidence and Oblique incidence – Reflection of Plane Waves by a perfect dielectric Brewster angle .Surface impedance
TUTORIAL 15

TOTAL : 60

TEXTBOOKS

1. William H.Hayt : "Engineering Electromagnetics" TATA 2003 (Unit I,II,III).
2. E.C. Jordan & K.G. Balmain "Electromagnetic Waves and Radiating Systems." Prentice Hall of India 2nd edition 2003. (Unit IV, V). McGraw-Hill, 9th reprint

REFERENCES

1. Ramo, Whinnery and Van Duzer: "Fields and Waves in Communications Electronics" John Wiley & Sons (3rd edition 2003)
2. .Narayana Rao, N : "Elements of Engineering Electromagnetics" 4th edition, Prentice Hall of India, New Delhi, 1998.
3. M.N.O.Sadiku: "Elements of Engineering Electromagnetics" Oxford University Press, Third edition.
4. David K.Cherp: "Field and Wave Electromagnetics - Second Edition-Pearson Edition.
5. David J.Grithiths: "Introduction to Electrodynamics- III Edition-PHI.

17152H13P **SEMESTER I**

DIGITAL ELECTRONICS

4-1-0-4

AIM

To learn the fundamental concepts those are useful for designing digital systems or circuits.

OBJECTIVES

- To introduce number systems and codes
- To introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To introduce the concept of memories devices.

UNIT I: BOOLEAN ALGEBRA AND MINIMIZATION 9

Basic theorems – Boolean functions – Canonical and Standard forms – Minimization techniques – K-map up to five variables – NAND and NOR implementation – Exclusive-OR function - Hardware Description Language (HDL).

UNIT II: DIGITAL LOGIC FAMILIES 9

Switching operation of PN junction diode – bipolar and MOS devices – Bipolar logic families – RTL – DTL – DCTL – HTL – TTL – ECL – MOS and CMOS – Tristate logic –Interfacing of CMOS and TTL families.

UNIT III: COMBINATIONAL LOGIC DESIGN 9

Design using gates – BCD arithmetic circuits – Binary adder – Subtractor – Multiplier – Divider – Design using MSI devices – Multiplexer and Demultiplexer as logic elements – Encoder and decoder – Parity checker – Parity generator – Code converter – Magnitude comparator.

UNIT IV: SEQUENTIAL LOGIC DESIGN 9

Flip Flops and their conversions – Analysis and synthesis of synchronous sequential circuits – Excitation table – State table and state diagram – Design of synchronous counters – Analysis of asynchronous sequential circuits – Reduction of state and flow table – Race free state assignment – Design of Asynchronous counters – Timing diagram – Shift registers and their applications.

UNIT V : MEMORY DEVICES 9

Classification of memories – ROM organization – PROM – EPROM – EEPROM – EAPROM – RAM organization – Write operation – Read operation – Memory cycle – Timing wave forms – Memory decoding – Memory expansion – Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell – Programmable Logic Devices – Programmable Logic Array (PLA) – Programmable Array Logic (PAL) –Field Programmable Gate Arrays (FPGA).

TUTORIAL 15 **TOTAL : 60**

TEXT BOOKS

1. Morris Mano M., "Digital Design", 3rd Edition, Pearson Education, 2007.
2. John M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2002.

REFERENCES

1. John F.Wakerly, "Digital Design", 4th Edition, Pearson/PHI, 2006
2. Charles H.Roth, " Fundamentals of Logic Design", Thomson Learning, 2003.
3. Donald P.Leach and Albert Paul Malvino, "Digital Principles and Applications", 6th Edition, TMH, 2003.

17152H14P **SEMESTER I**

ELECTRONIC CIRCUITS –I **4-1-0-3**

AIM

The aim of this course is to familiarize the student with the analysis and design of basic transistor Amplifier circuits and power supplies.

OBJECTIVE

On completion of this course the student will understand

- The methods of biasing transistors
- Design of simple amplifier circuits
- Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance
- Method of calculating cutoff frequencies and to determine bandwidth
- Design of power amplifiers and heat sinks
- Analysis and design of power supplies

UNIT – I TRANSISTER BIASING & STABILIZATION 9

Biasing circuits for BJT- DC load line-AC load line – Stability factor- Methods of Transistor Biasing- Bias Compensation – Thermal runaway- heat sink- FET Biasing

UNIT-II LOW FREQUENCY AMPLIFIER ANALYSIS & DESIGN 9

Transistor- FET amplifiers - Low frequency Small signal hybrid parameter model : $C_{B,}C_{E,}$Cc Amplifier- Analysis of Transistor Amplifier Using h-parameter.
JFET as an Amplifier- Analysis of low frequency common Source & Common Drain Amplifier Using h-parameter.

UNIT – III MULTISTAGE AMPLIFIERS 9

Cascading of BJT Amplifiers- Analysis of RC coupled Amplifiers Methods of Increasing Input impedance using Darlington and Boot strapping- Emitter coupled Differential Amplifier,Differential gain, CMRR, Transfer Characteristics – Cascode amplifier.

UNIT – IV HIGH FREQUENCY ANALYSIS OF THE AMPLIFIERS 9

Frequency response-Effect of Coupling and Bypass capacitor- Effect of internal transistor capacitance-Miller Effect – High Frequency π model for C_E Amplifier-C_E Short circuit Current gain- Cut off frequencies f_α, f_β ,f_T - Gain Band Width product.

UNIT – V POWER SUPPLIES 9

Haif wave,Full Wave, Rectifiers- Capacitor Filter- Linear Regulator :Shunt Regulator, Series Regulator- Shunt Regulator using Zener Diode- Switch Mode Power Supply.

TUTORIAL 15 TOTAL : 60

TEXT BOOK

1. Millman and Halkias.c."Integrated Electronics" Tata McGraw -Hill,1991

REFERENCE BOOKS

1. David A. Bell,"Electonic Devices And Circuits " Prentic Hall of India,1998.
2. Donal L. Schilling, Charles ,Belove "Electronic Circuits" Third Edition 2002.
3. Salivahanan "Electonic Devices And Circuits"
4. Boylestead, Robert L. and Louis Nasheresky- "Electonic Devices And Circuit
    a. Theory"-Pearson Education
5. J.B.Gupta - "Electonic Devices And Circuits"-S.K.Kataria and sons 2004.

17152H15P **SEMESTER I**

SIGNALS AND SYSTEMS

(Common to ECE & IT) **4-1-0-4**

AIM

To study and analyze the characteristics of continuous, discrete signals and systems.

OBJECTIVES

- To study the properties and representation of discrete and continuous signals.
- To study the sampling process and analysis of discrete systems using z-transforms.
- To study the analysis and synthesis of discrete time systems.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Continuous time signals (CT signals), discrete time signals (DT signals) - step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and aperiodic, Random signals, Classification of systems (CT systems and DT systems)- Linear time invariant systems.

UNIT II ANALYSIS OF CT SIGNALS 9

Fourier Transform and Laplace Transform in Signal Analysis. Fourier series, Fourier Transform and Laplace Transform properties, Parseval's relation.

UNIT III LTI-CT SYSTEMS 9

Differential equation, Block diagram representation, Impulse response, Convolution Integral, Frequency response, Fourier Methods and Laplace transforms in analysis.

UNIT IV SAMPLING THEOREM AND ANALYSIS OF DT- SIGNALS 9

Sampling theorem – Reconstruction of a Signal from its samples, aliasing – discrete time processing of continuous time signals, sampling of band pass signals

z-transform definition – region of convergence – properties of ROC – Properties of z-transform – Poles and Zeros – inverse z-transform, Relationship between z-transform and Fourier transform.

UNIT V LTI-DT SYSTEMS 9

Difference equations, Block diagram representation, Impulse response, Convolution SUM, Frequency response, Z-transform analysis.

TUTORIAL 15 **TOTAL : 60**

TEXT BOOK

1. AlanV.Oppenheim, Alan S.Willsky with S.Hamid Nawab, Signals & Systems, 2nd edn., Pearson Education, 1997.

REFERENCES

1. M.J.Roberts, Signals and Systems Analysis using Transform method and MATLAB, TMH 2003.
2. Simon Haykin and Barry Van Veen, Signals and Systems, John Wiley, 1999

K.Lindner, “Signals and Systems”, McGraw Hill International, 1999.

17148S21P **SEMESTER II**

NUMERICAL METHODS **4 1 0 4**

(Common to CSE, IT, ECE)

AIM

With the present development of the computer technology, it is necessary to develop efficient algorithms for solving problems in science, engineering and technology. This course gives a complete procedure for solving different kinds of problems occur in engineering numerically.

OBJECTIVES

At the end of the course, the students would be acquainted with the basic concepts in numerical methods ,

- The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigenvalue problem of a matrix can be obtained numerically where analytical methods fail to give solution.
- When huge amounts of experimental data are involved, the methods discussed on interpolation will be useful in constructing approximate polynomial to represent the data and to find the intermediate values.
- The numerical differentiation and integration find application when the function in the analytical form is too complicated or the huge amounts of data are given such as series of measurements, observations or some other empirical information.
- Since many physical laws are couched in terms of rate of change of one/two or more independent variables, most of the engineering problems are characterized in the form of either nonlinear ordinary differential equations or partial differential equations. The methods introduced in the solution of ordinary differential equations and partial differential equations will be useful in attempting any engineering problem.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9

Newton Raphson's method – Iteration method – Solution of linear system by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods- Inverse of a matrix by Gauss Jordon method – Eigenvalue of a matrix by power method.

UNIT II INTERPOLATION 9

Newton's forward and backward difference formulas – Central difference formula: Bessels and Stirling's formula - Lagrangian Polynomials – Divided difference method .

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integrals using trapezoidal and Simpson's rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

TUTORIAL 15 TOTAL : 60

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES

1. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

17153S22P **SEMESTER II**

ELECTRICAL ENGINEERING AND CONTROL SYSTEMS

4 1 0 4

AIM

To familiarize the students with concepts related to the operation analysis and stabilization of control systems

OBJECTIVES

- To understand the operation of Electrical machines and transformers
- To understand the open loop and closed loop (feedback) systems
- To understand time domain and frequency domain analysis of control systems required for stability analysis.
- To understand the compensation technique that can be used to stabilize control systems

UNIT-I: D.C MACHINES AND TRANSFORMERS 12

Construction and operation of D.C. generators – emf equation – characteristics – principle of operation of D.C. motors. Principle of operation of transformers -parameters of transformers – regulation, losses and efficiency - introduction to three phase transformers.

UNIT-II SPECIAL MACHINES 9

Constructional details and principle of operation of single phase induction motors and Three Phase Induction motors– servomotor, stepper motor, variable reluctance motors.- applications.

UNIT III INTRODUCTION TO CONTROL THEORY 6

The control problem – differential equation of physical systems – control over system dynamics by feedback – regenerative feedback – transfer function – block diagram - algebra – signal flow graphs.

UNIT IV TIME RESPONSE AND FREQUENCY RESPONSE ANALYSIS 12

Time response of first and second order system – steady state errors – error constants – design specification of second order systems – state variable analysis – simple problems. Correlation between time and frequency response – polar plots , Bode plots – stability in frequency domain using Nyquist stability criterion – simple problems.

UNIT V STABILITY **6**

Concept of stability – stability conditions and criteria – Hurwitz and Routh criterian – relative Stability analysis.

TUTORIAL :15 **TOTAL :60**

TEXT BOOK

1. D.P.Kothari and I.J. Nagrath "Basic Electrical Engineering", Tata McGraw Hill Ltd, second edition, 2002.
2. I.J.Nagrath and M.Gopal "Control system Engineering" New age International Publishing Company Ltd, third edition 2003.

REFERENCES

1.Stephen J.Chapman "Electrical Machinery Fundamentals", McGraw Hill Publishing Company Ltd, third edition, 1999.
2.K.Murugesh Kumar, "Electric Machines", Vikas Publishing House (P) Ltd, 2002.
3.M.Gopal "Control Systems – Principle and Design", McGraw Hill Publishing company Ltd, second edition, 2003.

17152H23P **SEMESTER II**

LINEAR INTEGRATED CIRCUITS **4 1 0 4**

AIM

To teach the basic concepts in the design of electronic circuits using linear integrated circuits and their applications in the processing of analog signals.

OBJECTIVES

- To introduce the basic building blocks of linear integrated circuits.
- To teach the linear and non-linear applications of operational amplifiers.
- To introduce the theory and applications of analog multipliers and PLL.
- To teach the theory of ADC and DAC
- To introduce a few special function integrated circuits.

UNIT I OP AMP CHARACTERISTICS AND APPLICATIONS 9

Ideal op amp, IC op amp, DC characteristics: bias, offset and drift, AC characteristics: bandwidth, slew rate, noise and frequency compensation, basic op amp application: scale changer, inverter and non inverter, summer & subtractor, , differentiator & integrator, instrumentation amplifier, V to I and I to V converter, RC active filters: low pass and band pass filters op amp circuits using diodes: precision rectifier, clipper and clamper,

UNIT II COMPARATORS AND SIGNAL GENERATORS 9

Comparator and applications of comparator, regenerative comparator (Schmitt trigger), square wave generator (astable multivibrator), monostable multivibrator Triangular wave generator, saw tooth wave generator sine wave generators

UNIT III ANALOG MULTIPLIER AND PLL 9

Multiplier, Applications of multiplier: multiplying DC voltages, frequency doubling, phase angle detection, AM modulation/demodulation. PLL: Basic principles, analog and digital phase detector and comparator Voltage controlled Oscillator, Applications of PLL

UNIT IV ADC AND DAC 9

Analog switches, High speed sample and hold circuits, characteristics DAC, Types of D/A converter, Current driven DAC, Switches for DAC, characteristics of A/D converter Types of A/D converter, - Single slope, Successive approximation.

UNIT V SPECIAL FUNCTION ICS 9

555 timer functional diagram,Astable and Monostable Multivibrators using 555 Timer, Voltage regulators-linear and switched mode types, Switched capacitor filter, Frequency to Voltage converters, and Isolation Amplifiers, Fiber optic ICs and Opto-couplers.

TUTORIAL 15 TOTAL : 60

TEXT BOOK

Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.

D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.

REFERENCES

1. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall of India, 1996.
2. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3. K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.
4. Millman.J. and Halkias.C.C. 'Integrated Electronics', McGraw-Hill, 1972. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits' Pearson Education, 2004.

17152H24P **SEMESTER II**

ELECTRONIC CIRCUITS -II **4 1 0 3**

AIM

The aim of this course is to familiarize the student with the analysis and design of feed back amplifiers, oscillators, tuned amplifiers, wave shaping circuits, multivibrators and blocking oscillators.

OBJECTIVES

On completion of this course the student will understand

- The advantages and method of analysis of feed back amplifiers
- Analysis and design of RC and LC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time based generators.

UNIT I : POWER AMPLIFIERS **9**

Classification, Efficiency of Class A , RC coupled, Transformer coupled, Class B push pull, Complementary symmetry power amplifier, Power Output, Efficiency and Power Dissipation, cross over distraction & Elimination, Heat sink.

UNIT II: FEEDBACK AMPLIFIERS **9**

Feedback concept, Four basic types of feedback, Equivalent Circuits of voltage amplifier, Current Amplifier ,Trans conductance, Trans resistance amplifier, Transfer ratio for negative feedback, Effect of feedback on noise, distortion gain input & output, impedance of the amplifier. Method of identifying feedback topology, Analysis of four types of feedback amplifier.

UNIT III: OSCILLATORS **9**

Theory of Oscillator, Closed loop gain of the circuits, Barhausen Criterion. Analysis & Design of RC Phase Shift Oscillators, Wien Bridge Oscillator, Hartley Oscillator Colpitts Oscillator, crystal Oscillator, frequency Stability.

UNIT IV: TUNED AMPLIFERS **9**

Tuned Circuit, Resonance, Q factor, Classification of tuned amplifier, Analysis of single tuned amplifier, Capacitance coupling, Effect of cascading single tuned amplifier on Band width, Double tuned amplifier, instability of tuned amplifiers- stabilization techniques, Narrow band neutralization using coil, Class C tuned amplifiers and their applications. Efficiency of Class C tuned Amplifier.

UNIT V: WAVE SHAPING, SWEEP & MULTIVIBRATOR CIRCUTS 9

RL & RC Integrator and Differentiator circuits. Voltage sweep circuit , Miller sweep generator, UJT saw tooth generator, current time base generator, Collector coupled Astable Multivibrator, Collector coupled Monosatble Multivibrator - Bistable Multivibrator - Schmitt trigger circuits.

TUTORIAL 15 **TOTAL : 60**

Text Books:

1. Millman J. and Halkias C.C., " Integrated Electronics ", McGraw Hill 1991
2. Schilling Charles Belove, " Electronic Circuits ", Third Edition, 2002.
3. Millman J. and Taub H., " Pulse Digital and Switching waveform ",
4. McGraw Hill International.
5. Robert L. Boylest and Louis Nasheresky, “Electronic Devices and Circuits theory” 8th edn., PHI, 2002.

References:

1. Sedra / Smith, “Micro Electronic Circuits” Oxford University Press, 2004.
2. David A.Bell, “Solid State Pulse Circuits”, Prentice Hall of India, 1992.

TRANSMISSION LINES AND WAVEGUIDES 4 1 0 4

AIM

To lay a strong foundation on the theory of transmission lines and wave guides by highlighting their applications.

OBJECTIVES

- To become familiar with propagation of signals through lines
- Understand signal propagation at Radio frequencies
- Understand radio propagation in guided systems
- To become familiar with resonators

UNIT I TRANSMISSION LINE THEORY 9

Different types of transmission lines – Definition of Characteristic impedance and Propagation Constant, General Solution of the transmission line –wavelength and velocity of propagation. Waveform distortion – distortion less transmission line –Input impedance of lossless lines – reflection on a line not terminated by Z_o - reflection factor and reflection loss – Numerical problems.

UNIT II THE LINE AT RADIO FREQUENCIES 9

Standing waves and standing wave ratio on a line – One-eighth wave line – The quarter wave line and impedance matching – the half wave line.
– The Smith Chart – Application of the Smith Chart – Problems using smith chart (how to use smith chart and mark impedances, finding input impedance, SWR, reflection coefficient, finding load impedance) single stub matching - Numerical problems.

UNIT III GUIDED WAVES 9

Waves between parallel planes of perfect conductors – Transverse electric and transverse magnetic waves – characteristics of TE and TM Waves – Transverse Electromagnetic waves – Velocities of propagation. – Wave impedances – Numerical problems.

UNIT IV RECTANGULAR WAVEGUIDES 9

Transverse Magnetic Waves in Rectangular Wave guides – Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM Waves – cut-off wavelength and phase velocity - Dominant mode in rectangular waveguide –Wave impedance, Characteristic impedance - Numerical problems.

UNIT V CIRCULAR WAVE GUIDES AND RESONATORS 9

TM and TE waves in circular guides – wave impedances and characteristic impedance – Dominant mode in circular waveguide – excitation of modes – Microwave cavities, Rectangular cavity resonators, circular cavity resonator – Q factor of cavity resonator for TE101 mode - Numerical problems.

TUTORIAL 15 **TOTAL: 60**

TEXT BOOKS

1. J.D.Ryder "Networks, Lines and Fields", PHI, New Delhi, 2003. (Unit I & II)
2. E.C. Jordan and K.G.Balmain "Electro Magnetic Waves and Radiating System, PHI, New Delhi, 2003. (Unit III, IV & V)

REFERENCES

1. Ramo, Whineery and Van Duzer: "Fields and Waves in Communication Electronics" John Wiley, 2003.
2. David M.Pozar: Microwave Engineering – 2nd Edition – John Wiley.
3. David K.Cheng,Field and Waves in Electromagnetism, Pearson

17148S31P **SEMESTER III**

PROBABILITY AND RANDOM PROCESSES

(Common to ECE & BM) **4-1-0-4**

AIM

This course aims at providing the necessary basic concepts in random processes. A knowledge of fundamentals and applications of phenomena will greatly help in the understanding of topics such a estimation and detection, pattern recognition, voice and image processing networking and queuing.

OBJECTIVES

At the end of the course, the students would

- Have a fundamental knowledge of the basic probability concepts.
- Have a well – founded knowledge of standard distributions which can describe real life phenomena.
- Acquire skills in handling situations involving more than one random variable and functions of random variables.
- Understand and characterize phenomena which evolve with respect to time in probabilistic manner.
- Be able to analyze the response of random inputs to linear time invariant systems.

UNIT I PROBABILITY AND RANDOM VARIABLE 9

Axioms of probability - Conditional probability - Baye's theorem- Random variable - Probability mass function - Probability density function - Properties - Moments - Moment generating functions and their properties.

UNIT II STANDARD DISTRIBUTIONS 9

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

UNIT III TWO DIMENSIONAL RANDOM VARIABLES 9

Joint distributions - Marginal and conditional distributions – Covariance - Correlation and regression (for distributions only) - Transformation of random variables - Central limit theorem.

UNIT IV CLASSIFICATION OF RANDOM PROCESSES 9

Definition and examples - first order, second order, strictly stationary, wide – sense stationary and Ergodic processes - Markov process - Binomial, Poisson and Normal processes - Sine wave process.

UNIT V CORRELATION AND SPECTRAL DENSITIES 9

Auto correlation - Cross correlation - Properties – Power spectral density – Cross spectral density - Properties – Relationship between cross power spectrum and cross correlation function – Auto correlation and cross correlation functions of input and output.

TUTORIAL 15 TOTAL : 60

TEXT BOOKS

1. Ross, S., "A First Course in Probability", Fifth edition, Pearson Education, Delhi, 2002.
2. Peebles Jr. P.Z., "Probability Random Variables and Random Signal Principles", Tata McGraw-Hill Pubishers, Fourth Edition, New Delhi, 2002. (Chapters 6, 7 and 8).

MICROPROCESSOR, INTERFACING AND APPLICATIONS 4 1 0 4

AIM

To learn the architecture programming ,interfacing and applications of microprocessors.

OBJECTIVES

- To introduce the architecture and programming of 8085 microprocessor.
- To introduce the interfacing of peripheral devices with 8085 microprocessor.
- To introduce the architecture and programming of 8086 microprocessor.
- To introduce the applications, programming with 8085 microprocessor.

UNIT I 8085 CPU 9

8085 Architecture – Instruction set – Addressing modes –– Assembly language programming – Interrupts – Memory interfacing – Interfacing, I/O devices.

UNIT II PERIPHERALS INTERFACING 9

Interfacing Serial I/O (8251) - parallel I/O (8255) –Keyboard and Display controller (8279) – ADC/DAC interfacing –

UNIT III 8086 CPU 9

Intel 8086 Internal Architecture – 8086 Addressing modes- Instruction set- 8086 Assembly language Programming–Interrupts.

UNIT IV 8086 SYSTEM DESIGN 9

8086 signals and timing – MIN/MAX mode of operation – Addressing memory and I/O – Multiprocessor configurations – System design using 8086

UNIT V 8085 APPLICATIONS 9

Stepper motor control – DC motor control –Traffic light control ––Digital Clock – Square wave generation –

TUTORIAL 15 **TOTAL : 60**

TEXT BOOKS

1. Ramesh S Gaonkar, Microprocessor Architecture, Programming and application with 8085, 4th Edition, Penram International Publishing, New Delhi, 2000. (Unit I, II)
2. John Uffenbeck, The 80x86 Family, Design, Programming and Interfacing, Third Edition. Pearson Education, 2002.
3. S.P.Chowdhury , Sunetra Chowdhury,Microprocessor & Peripherals ,First Edition ,Scitech Publications(INDIA)Pvt. Ltd.(Unit V)

REFERENCES

1. A.K. Ray and K.M.Burchandi, Intel Microprocessors Architecture Programming and Interfacing, McGraw Hill International Edition, 2000(Unit III,IV)
2. Kenneth J Ayala, The 8051 Microcontroller Architecture Programming and Application, 2nd Edition, Penram International Publishers (India), New Delhi, 1996.
3. M. Rafi Quazzaman, Microprocessors Theory and Applications: Intel and Motorola prentice Hall of India, Pvt. Ltd., New Delhi, 2003.

17152H33P **SEMESTER III**

DIGITAL SIGNAL PROCESSING **4 1 0 4**

AIM

To study the signal processing methods and processors.

OBJECTIVES

- To study DFT and its computation
- To study the design techniques for digital filters
- To study the finite word length effects in signal processing
- To study the non-parametric methods of power spectrum estimations
- To study the fundamentals of digital signal processors.

UNIT I FAST FOURIER TRANSFORM 9

Discrete Time Fourier Transform (DTFT), Introduction to DFT – Efficient computation of DFT Properties of DFT – FFT algorithms – Radix-2 and Radix-4 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms

UNIT II IIR FILTER DESIGN 9

Structure of IIR – System Design of Discrete time IIR filter from continuous time filter – IIR filter design by Impulse Invariance. Bilinear transformation – Approximation derivatives – Design of IIR filter in the Frequency domain.

UNIT III FIR FILTER DESIGN 9

Symmetric & Antisymteric FIR filters – Linear phase filter – Windowing technique – Rectangular, Hamming– Frequency sampling techniques

UNIT IV FINITE WORD LENGTH EFFECTS 9

Quantization noise – derivation for quantization noise power – Fixed point and binary floating point number representation – comparison – over flow error – truncation error – co-efficient quantization error - limit cycle oscillation – signal scaling –

UNIT V POWER SPECTRUM ESTIMATION 9

Computation of Energy density spectrum – auto correlation and power spectrum of random signals. Periodogram – use of DFT in power spectrum estimation – Non parametric methods for power spectral estimation: Bartlett methods –Application of DSP – Model of Speech Wave Form – Vocoder.

TUTORIAL 15 **TOTAL : 60**

TEXT BOOK

1. John G Proakis and Dimtris G Manolakis, “Digital Signal Processing Principles, Algorithms and Application”, PHI/Pearson Education, 2000, 3rd Edition.

REFERENCES

1. Alan V Oppenheim, Ronald W Schafer and John R Buck, “Discrete Time Signal Processing”, PHI/Pearson Education, 2000, 2nd Edition.
2. Johny R.Johnson, “Introduction to Digital Signal Processing”, Prentice Hall of India/Pearson Education, 2002.
3. Sanjit K.Mitra, “Digital Signal Processing: A Computer – Based Approach”, Tata McGraw-Hill, 2001, Second Edition.

17152H34P **SEMESTER III**

COMMUNICATION THEORY **4 1 0 4**

AIM

To study the various analog communication fundamentals viz., Amplitude modulation and demodulation, angle modulation and demodulation. Noise performance of various receivers and information theory with source coding theorem are also dealt.

OBJECTIVE

- To provide various Amplitude modulation and demodulation systems.
- To provide various Angle modulation and demodulation systems.
- To provide some depth analysis in noise performance of various receiver.
- To study some basic information theory with some channel coding theorem.

UNIT 1 AMPLITUDE MODULATION SYSTEMS 10

Review of spectral characteristics of periodic and non-periodic signals – Generation and demodulation of AM, DSBSC, SSB and VSB signals – Comparison of amplitude modulation systems – Frequency translation – FDM – Non-linear distortion.

UNIT II ANGLE MODULATION SYSTEMS 8

Phase and frequency modulation – Single tone – Narrow band and wideband FM – Transmission bandwidth – Generation and demodulation of FM signal.

UNIT III NOISE THEORY 8

Review of probability – Random variables and random process – Gaussian process –Noise – Shot noise – Thermal noise and white noise – Narrow band noise – Noise temperature – Noise figure.

UNIT IV PERFORMANCE OF CW MODULATION SYSTEMS 10

Superheterodyne radio receiver and its characteristic – SNR – Noise in DSBSC systems using coherent detection – Noise in AM system using envelope detection FM system – FM threshold effect – Pre-emphasis and de-emphasis in FM – Comparison of performances.

UNIT V INFORMATION THEORY 9

Discrete messages and information content – Concept of amount of information – Average information – Entropy – Information rate – Source coding to increase average information per bit – Shannon-fano coding – Huffman coding – Lempel-Ziv (LZ) coding – Shannon's theorem – Channel capacity – Bandwidth – S/N trade-off – Mutual information and channel capacity – Rate distortion theory – Lossy source coding.

TUTORIAL 15 **TOTAL : 60**

TEXT BOOKS

1. Dennis Roddy and John Coolen., “Electronic Communication”, 4th Edition, PHI,1995.
2. Herbert Taub and Donald L Schilling., “Principles of Communication Systems”, 3rd Edition, TMH, 2008.

REFERENCES

1. Simon Haykin., “Communication Systems”, 4th Edition, John Wiley and Sons, 2001.
2. Bruce Carlson., “Communication Systems”, 3rd Edition, TMH, 1996.
3. Lathi, B. P., “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford Press, 2007.
4. John G. Proakis, Masoud Salehi., “Fundamentals of Communication Systems”, 5th Edition, Pearson Education, 2006.

DIGITAL SIGNAL PROCESSING AND MICRO PROCESSOR LAB 0 0 3 2

PART-I DSP LAB

Using Processor & MATLAB:

1. Study of various addressing modes of DSP using simple programming examples
2. Sampling of input signal and display
3. Implementation of FIR filter
4. Calculation of FFT
5. Linear & Circular Convolution

PART –II MICROPROCESSOR LAB

1. Programs for 8/16 bit Arithmetic operations (Using 8085).
2. Programs for Sorting and Searching (Using 8085, 8086).
3. Parallel Communication between two MP Kits using Mode 1 and Mode 2 of 8255.
4. Interfacing and Programming 8253
5. Serial Communication between two MP Kits using 8251.

Interfacing and Programming of Stepper Motor and DC Motor Speed control

17152H41P **SEMESTER IV**

DIGITAL COMMUNICATION **4 1 0 4**

AIM

To introduce the basic concepts of Digital Communication modulation to baseband, passband modulation and to give an exposure to error control coding and finally to discuss about the spread spectrum modulation schemes.

OBJECTIVES

- To study pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.
- To learn baseband pulse transmission, which deals with the transmission of pulse-amplitude, modulated signals in their baseband form.
- To learn error control coding which encompasses techniques for the encoding and decoding of digital data streams for their reliable transmission over noisy channels.

UNIT I: Digital communication Introduction and Pulse modulation 9

Block Diagram of digital communication systems Advantages, Disadvantages, Sampling, Aliasing, Pulse Amplitude Modulation, Pulse Duration and Pulse position Modulation, Pulse Coded Modulation, Delta Modulation, TDM

UNIT II: Baseband Pulse Transmission 9

Matched Filters , ,Intersymbol Interference , Nyquist Pulse Shaping, M-ary PAM Transmission
Linear Equalizers , Adaptive Equalizers

UNIT III: Digital Bandpass Transmission 9

Representations of Bandpass Signals and Systems Correlation, Signal-space representations ,Detection of Known Signals in AWGN , Generation ,detection, spectra, applications, signal space diagram of FSK, PSK, MSK

UNIT IV: Spread Spectrum Communications 9

Advantages, characteristic of Spread Spectrum Communication. Direct Sequence spreqad spectrum systems, Frequency Hopping spread spectrum communication, Psedu Noise sequences: Types and Characteristics, code-division multiplexing (CDM). Application to CDMA wireless communication systems

UNIT V: Error Control coding 9

Linear block codes, convolutional codes, Hamming codes

TUTORIAL 15 TOTAL: 60

Textbook:

1. S. Haykin, Communication Systems, Fourth Edition, Wiley, 2001. TK5101.H37 2000

Reference:

1. L.W. Couch II, *Digital and Analog Communication Systems*, Sixth Edition, Prentice-Hall,2001.
2. B.P. Lathi, *Modern Digital and Analog Communication Systems*, Oxford University Press, 1998. TK5101.L333
3. John Proakis "Digital Communications" , McGraw-Hill Science/Engineering/Math; 4 edition 2000

17152H42P **SEMESTER IV**

ANTENNA AND WAVE PROPAGATION **4 1 0 4**

AIM

To enable the student to study the various types of antennas and wave propagation.

OBJECTIVES

- To study radiation from a current element.
- To study antenna arrays
- To study aperture antennas
- To learn special antennas such as frequency independent and broad band antennas.
- To study radio wave propagation.

UNIT I : RADIATION 9

Concept of Vector potentials- Modification for Time varying , retarded case- Fields and radiation resistance of an alternating current element- -Radiation resistance –Effective length – Radiation intensity-Gain and Directivity-Field patterns- Beamwidth – Effective area-Relation between gain, effective length and radiation resistance.

UNIT II: ANTENNA ARRRAYS 9

Arrays of two point sources- Broadside array and End fire arrays – Binomial arrays - Pattern multiplication- Uniform linear array-

UNIT III : SPECIAL PURPOSE ANTENNAS 9

Radiation from traveling wave on wire- Rhombic antenna – Loop antennas- Three element Yagi antenna- Log periodic antenna- Horn antenna -

UNIT IV: PROPAGATION 9

Ground wave propagation: Attenuation characteristics – Calculation of field strength –
Sky wave Propagation: Structure of Ionosphere – Effective dielectric constant of ionized region-Mechanism of Refraction and Refractive index- Critical Frequeny- Skip distance-Maximum usable frequency –Fading and Diversity Techniques.
Space Wave Propagation: Calculation of Field strength –-Duct propagation.

UNIT V : MEASUREMENTS 9

Impedance – Field Pattern and Gain of Antennas- Radiation Pattern –Ionospheric measurements-Vertical incidence measurements of the ionosphere- Relation between oblique and vertical incidence transmission.

TUTORIAL 15 **TOTAL: 60**

Text Books:

1. EDWARD C.JORDAN- Electromagnetic waves and Radiation systems – Asia Publication House, PHI, 1978, Reprint 2003.

Reference Books:

1. Jhon .D. Kraus and Ronalatory Marhefka- Antenna-T McGraw Hill – 2002
2. R.E.Collins-Antennas and Radio Propagation- McGrawhill- 1987
3. Ballany – Antenna Theory- Jhon wiley & sons – 2^{nd} edition 2003.

17152H43P **SEMESTER IV**

COMPUTER NETWORKS **4 0 0 4**

AIM

To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

OBJECTIVES

- To introduce the students the functions of different layers.
- To introduce IEEE standard employed in computer networking.
- To make students to get familiarized with different protocols and network components.

UNIT I DATA COMMUNICATIONS 8

Components – Direction of Data flow – networks – Components and Categories – types of Connections – Topologies –Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences.

UNIT II DAT LINK LAYER 12

Error – detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – go back N ARQ – selective repeat ARQ- sliding window techniques – HDLC.

LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

UNIT III NETWORK LAYER 10

Internetworks - Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

UNIT IV TRANSPORT LAYER 8

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.

UNIT V APPLICATION LAYER 7

Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

TOTAL : 45

TEXT BOOKS

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

REFERENCES

1. James .F. Kurouse & W. Rouse, "Computer Networking: A Topdown Approach Featuring", Pearson Education.
2. Larry L.Peterson & Peter S. Davie, "COMPUTER NETWORKS", Harcourt Asia Pvt. Ltd., Second Edition.
3. Andrew S. Tannenbaum, "Computer Networks", PHI, Fourth Edition, 2003.
4. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000.

NETWORKS AND COMMUNICATION LAB **0-0-3-2**

Part I: NETWORKS

1. PC to PC Communication
   Parallel Communication using 8 bit parallel cable
   Serial communication using RS 232C
2. Ethernet LAN protocol
   To create scenario and study the performance of CSMA/CD protocol ethrol simulation
3. Token bus and token ring protocols
   To create scenario and study the performance of token bus and token ring protocols through simulation
4. Wireless LAN protocols
   To create scenario and study the performance of network with CSMA / CA protocol and compare with CSMA/CD protocols.
5. Implementation and study of stop and wait protocol

Part II: COMMUNICATION

1. Modulation and Demodulation Characteristics of AM/FM Transmitter And Reciever.
2. Pulse modulation- PAM / PWM /PPM
3. Pulse code modulation
4. Digital modulation –ASK, PSK, QPSK, FSK
5. Experiments on Antenna:
   To plot and analyse the radiation patterns of the following antennas.
   - Dipole
   - Half Wave Dipole
   - Monopole
   - Yagi Antenna
6. Experiments on Coaxial Line Section:
   - Measurement of VSWR
   - . Stub matching

ELECTIVE - I

17152E44AP **SEMESTER IV**

HIGH SPEED NETWORKS **4-0-0-4**

AIM

To highlight the features of different technologies involved in High Speed Networking and their performance.

OBJECTIVES

- Students will get an introduction about ATM and Frame relay.
- Students will be provided with an up-to-date survey of developments in High Speed Networks.
- Enable the students to know techniques involved to support real-time traffic and congestion control.

Students will be provided with different levels of quality of service (Q.S) to different applications.

UNIT I HIGH SPEED NETWORKS 9

Frame Relay Networks – Asynchronous transfer mode – ATM Protocol Architecture, ATM Cell – ATM Service Categories – AAL.
High Speed LANs: Fast Ethernet, Gigabit Ethernet, Wireless LANs: applications, requirements – Architecture of 802.11

UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts, switch forwarding techniques, switch path control, LAN switching, cut through forwarding, store and forward, Virtual LANs

UNIT III TCP AND ATM CONGESTION CONTROL 9

TCP Flow control – TCP Congestion Control – Retransmission – Timer Management – Exponential RTO backoff – KARN's Algorithm — Performance of TCP over ATM. Traffic and Congestion control in ATM – Requirements – Attributes – Traffic Management Frame work, Traffic Control – ABR traffic Management – ABR rate control, RM cell formats,– GFR traffic management.

UNIT IV INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture – Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ – Random Early Detection, Differentiated Services

UNIT V IP SWITCHING 9

Addressing model, IP Switching types-flow driven and topology driven solutions, IP Over ATM address and next hop resolution, multicasting,

TOTAL : 45

TEXT BOOK

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

17152E44BP **SEMESTER IV**

ADVANCED DIGITAL SIGNAL PROCESSING **4 0 0 4**

AIM

To introduce the student to advanced digital signal processing techniques.

OBJECTIVES

- To study the parametric methods for power spectrum estimation.
- To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.
- To study multirate signal processing fundamentals.
- To study the analysis of speech signals.
- To introduce the student to wavelet transforms.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes-, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram -, Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method.

Parametric Methods - AR, MA, and ARMA model based spectral estimation.

UNIT III LINEAR ESTIMATION AND PREDICTION

Linear prediction- Forward and backward predictions, - Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation for sampling rate conversion- Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

REFERENCES:

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.

17152E44CP **SEMESTER IV**

SPEECH PROCESSING **4 0 0 4**

AIM

To introduce the characteristics of Speech signals and the related time and frequency domain methods for speech analysis and speech compression

OBJECTIVE

- To introduce the models for speech production
- To develop time and frequency domain techniques for estimating speech parameters
- To introduce a predictive technique for speech compression
- To understand speech recognition, synthesis and speaker identification.

UNIT I: NATURE OF SPEECH SIGNAL 9

Speech production mechanism – Classification of speech – Sounds – Nature of speech signal – Models of speech production

Speech Signal Processing: Purpose of speech processing – Digital models for speech signal – Digital processing of speech signals – Significance – Short time analysis.

UNIT II: TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of speech – Methods for extracting the parameters – Zero crossings – Auto correlation function – Pitch estimation.

UNIT III: FREQUENCY DOMAIN METHODS FOR SPEECH PROCESSING 9

Short time fourier analysis – Filter bank analysis – Spectrographic analysis – Format extraction – Pitch extraction – Analysis – Synthesis systems.

UNIT IV: LINEAR PREDICTIVE CODING OF SPEECH 9

Formulation of linear prediction problem in time domain – Solution of normal equations – Interpretation of linear prediction in auto correlation and spectral domains.

UNIT V: HOMOMORPHIC SPEECH ANALYSIS 9

Central analysis of speech – Format and pitch estimation – Applications of speech processing – Speech recognition – Speech synthesis and speaker verification.

Total: 45

TEXTBOOK

1. Rabiner L.R. and Schafer R.E, “Digital Processing of Speech Signals”, Prentice Hall, 1978.

REFERENCES

1. Flanagan J.L, “Speech Analysis Synthesis and Perception”, 2nd Edition, Springer
2. Vertag, 1972.
Witten I.H., “Principles of Computer Speech”, Academic Press, 1983.

17152E44DP **SEMESTER IV**

FUZZY LOGIC AND NEURAL NETWORKS **4 0 0 4**

AIM

To introduce the techniques of soft computing and adaptive neuro-fuzzy inferencing systems which differ from conventional AI and computing in terms of its tolerance to imprecision and uncertainty.

OBJECTIVES

- To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems
- To provide the mathematical background for carrying out the optimization associated with neural network learning
- To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
- To introduce case studies utilizing the above and illustrate the intelligent behavior of programs based on soft computing

UNIT I: Primer on Fuzzy Sets **9**

Crisp sets, from crisp sets to fuzzy sets , Linguistic variables ,Membership functions Some terminology , Set theoretic operations for crisp sets , Set theoretic operations for fuzzy sets , membership functions

UNIT II: Fuzzy Logic Systems **9**

Introduction , Rules , Fuzzy Inference Engine , Fuzzification and Its Effect on Inference Fuzzifier , Fuzzy inference engine, Defuzzification, Centroid defuzzifier , Center-of-sums defuzzifier

UNIT III: Neural Nets Introduction and Overview **9**

Perceptrons,Least Mean Square Learning Systems , Multilayer Neural Networks Back-Propagation The Practical Application of Back-Propagation
Error Rate and Complexity Fit Estimation Improving on Standard Back-Propagation

UNIT IV: Radial Basis Function Networks **9**

Ill-Posed Problems and the Regularization Technique , Stabilizers and Basis Functions, Generalized Radial Basis Function Networks, Moving Centers Learning, Regularization with Nonradial Basis Functions, Orthogonal Least Squares, Optimal Subset Selection by Linear

UNIT V: ANFIS: Adaptive Neuro-Fuzzy Inference Systems **9**

Introduction , ANFIS Architecture , Hybrid Learning Algorithm , Learning Methods that Cross-fertilize ANFIS and RBFN , ANFIS as a Universal Approximator

TOTAL : 45

Textbook:

1. Bart Kosko, Neural networks and fuzzy systems: a dynamical systems approach to machine intelligence, Prentice-Hall, Inc., Upper Saddle River, NJ, 1991

Reference:

1. Kin, S. (1999), Neural Networks: A Comprehensive Foundation, 2nd ed.,Upper Saddle River, NJ: Prentice Hall, ISBN 0-13-273350-1.
2. Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani (1997)” Neuro-Fuzzy and Soft Computing: A Computational Approach to Learning and Machine Intelligence, | Prentice Hall

ADVANCED ELECTRONIC SYSTEM DESIGN 4 0 0 4

AIM

To get knowledge about usage of electronic devices in Communication Engineering and Power supplies.

OBJECTIVE

- To study RF component such as resonator, filter, transmission lines, etc…
- To learn design of RF amplifiers using transistors.
- To study modern Power Supplies using SCR and SMPS technology
- To learn about signal shielding & grounding techniques and study of A/D and D/A Converters.
- To learn knowledge about fabrication of PCBs using CAD.

UNIT I: INTRODUCTION TO RF DESIGN 9

RF behaviour of passive components – Chip components and circuit board considerations – Review of transmission lines – Impedance and admittance transformation – Parallel and series connection of networks – ABCD and scattering parameters – Analysis of amplifier using scattering parameter – RF filter – Basic resonator and filter configurations – Butterworth and chebyshev filters – Implementation of microstrip filter design – Band pass filter and cascading of band pass filter elements.

UNIT II: RF TRANSISTOR AMPLIFIER DESIGN 9

Impedance matching using discrete components – Microstrip line matching networks – Amplifier classes of operation and biasing networks – Amplifier power gain– Unilateral design(S_{12} =0) – Simple input and output matching networks – Bilateral design – Stability circle and conditional stability – Simultaneous conjugate matching for unconditionally stable transistors – Broadband amplifiers – High power amplifiers and multistage amplifiers.

UNIT III: DESIGN OF POWER SUPPLIES 9

DC power supply design using transistors and SCR’s – Design of crowbar and foldback protection circuits – Switched Mode Power Supplies(SMPS) – Forward – Fly back-buck and boost converters – Design of transformers and control circuits for SMPS.

UNIT IV: DESIGN OF DATA ACQUISITION SYSTEMS 9

Amplification of low level signals – Grounding – Shielding and guarding techniques – Dual slope – Quad slope and high speed A/D converters – Microprocessors compatible A/D converters – Multiplying A/D converters and logarithmic A/D converters – Sample and hold – Design of two and four wire transmitters.

UNIT V: DESIGN OF PRINTED CIRCUIT BOARDS 9

Introduction to technology of Printed Circuit Boards (PCB) – General lay out and rules and parameters – PCB design rules for digital – High frequency – Analog – Power electronics and microwave circuits – Computer Aided Design(CAD) of PCB's.

Total: 45

TEXT BOOKS

1. Reinhold Luduig and Pavel Bretchko, "RF Circuit Design – Theory and Applications", Pearson Education, 2000.
2. Sydney Soclof, "Applications of Analog Integrated Circuits", PHI, 1990.
3. Walter C. Bosshart, "Printed Circuit Boards – Design and Technology", TMH, 1983.

REFERENCES

1. Keith H. Billings, "Handbook of Switched Mode Supplies", TMH Publishing Co., 1989.
2. Michael Jaacob, "Applications and Design with Analog Integrated Circuits", PHI, 1991.
3. Otmar Kigenstein, "Switched Mode Power Supplies in Practice", John Wiley and Sons, 1989.
4. Muhammad H. Rashid, "Power Electronics – Circuits, Devices and Applications",

17152H51P **SEMESTER V**

OPTICAL COMMUNICATION AND NEWORKS **4 0 0 4**

AIM

- To introduce the various optical fiber modes, configurations and various signal degradation factors associated with optical fiber.
- To study about various optical sources and optical detectors and their use in the optical communication system. Finally to discuss about digital transmission and its associated parameters on system performance.

OBJECTIVES

- To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.
- To understand the different kind of losses, signal distortion in optical wave guides and other signal degradation factors. Design optimization of SM fibers, RI profile and cut-off wave length.
- To learn the various optical source materials, LED structures, quantum efficiency, Laser diodes and different fiber amplifiers.
- To learn the fiber optical receivers such as PIN APD diodes, noise performance in photo detector, receiver operation and configuration.
- To learn fiber slicing and connectors, noise effects on system performance, operational principles WDM and solutions.

UNIT I INTRODUCTION TO OPTICAL FIBERS 9

Evolution of fiber optic system- Element of an Optical Fiber Transmission link- Ray Optics-Optical Fiber Modes and Configurations –fiber types Mode theory of Circular Wave guides- Overview of Modes- Key model concepts- Linearly Polarized Modes – Single Mode Fibers-

UNIT II SIGNAL DEGRADATION OPTICAL FIBERS 9

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides-Information Capacity determination – Group Delay-Material Dispersion, Wave guide Dispersion, Signal distortion in SM fibers -Mode Coupling

UNIT III FIBER OPTICAL SOURCES AND COUPLING 9

Direct and indirect Band gap materials-LED structures –Quantum efficiency Modulation of a LED, lasers Diodes-Modes and Threshold condition Fiber amplifiers- Power Fibre –to- Fibre joints, Fibre splicing.

UNIT IV FIBER OPTICAL RECEIVERS 9

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error –

UNIT V DIGITAL TRANSMISSION SYSTEM 9

Point-to-Point links System considerations –Link Power budget –Rise - time budget –Noise Effects on System Performance-Operational Principles of WDM, Solitons-. Basic on concepts of SONET/SDH Network. .

TOTAL : 45

TEXT BOOK

1. Gerd Keiser, "Optical Fiber Communication" McGraw –Hill International, Singapore, 3rd ed., 2000

REFERENCES

1. J.Senior, "Optical Communication, Principles and Practice", Prentice Hall of India, 1994.
2. J.Gower, "Optical Communication System", Prentice Hall of India, 2001.

17152H52P **SEMESTER V**

MICROWAVE ENGINEERING **4 0 0 4**

Aim

To enable the student to become familiar with active & passive microwave devices & components used in Microwave communication systems.

Objectives

- To study passive microwave components and their S- Parameters.
- To study Microwave semiconductor devices & applications.
- To study Microwave sources and amplifiers.

Unit – I: Introduction **9**

Radio Spectrum – Microwave Frequency and its characteristics – Transmission media for microwave signals – Waveguides – Scattering Parameters for microwave network (two ports)

Unit – II: Passive Microwave Devices **9**

Isolators, Attenuators, Directional Couplers – Waveguide Tees – E- plane, H-Plane and Magic Tee –- Matched Terminators – S – parameters for all the components

Unit – III: Microwave Sources **9**

Klystron Oscillator – Magnetron Oscillator– TWTA Amplifier – Power output and efficiency equations for all the devices

Unit – IV: Semiconductor Microwave Devices **9**

PIN Diode – Varactor Diode (Manley – Rowe Power Relation) – Tunnel Diode – Gunn Diode – Applications of all the diodes –

Unit – V Microwave Measurements **9**

Power Measurements – Frequency Measurements – VSWR Measurements (High and Low VSWR) – Attenuation Measurements – Insertion Loss Measurements

TOTAL : 45

Text Book:

1. Samuel Y.LIAO : Microwave Devices and Circuits – Prentice Hall of India – 3rd Edition (2003)
2. Annapurna Das and Sisir K.Das: Microwave Engineering – Tata McGraw-Hill (2000) (UNIT V)

Reference:

R.E. Collin : Foundations for Microwave Engg. – IEEE Press Second Edition (2002)
David M.POZAR : Microwave Engg. – John Wiley & Sons – 2nd Edition (2003)
P.A.RIZZI – Microwave Engg. (Passive)

17152H53P **SEMESTER V**

VLSI DESIGN **4 1 0 4**

AIM

To introduce the technology, design concepts and testing of Very Large Scale Integrated Circuits.

OBJECTIVES

- To learn the basic CMOS circuits.
- To learn the CMOS process technology.
- To learn techniques of chip design using programmable devices.
- To learn the concepts of designing VLSI subsystems.
- To learn the concepts of modeling a digital system using Hardware Description Language.

UNIT I CMOS TECHNOLOGY 9

An overview of Silicon semiconductor technology, Basic CMOS technology : nwell, P well, Twin tub and SOI Process. Interconnects, circuit elements: Resistors, capacitors, Electrically alterable ROMs, bipolar transistors, Latch up and prevention.

UNIT II MOS TRANSISTOR THEORY 9

NMOS, PMOS Enhancement transistor, Threshold voltage, Body effect, MOS DC equations, channel length modulation, Mobility variation, MOS models, small signal AC characteristics, complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time

UNIT III SPECIFICATION USING VERILOG HDL 9

Basic Concepts: VLSI Design flow, identifiers, gate primitives, value set, ports, gate delays, , Behavioral and RTL modeling: Operators, timing controls, Procedural assignments conditional statements, Data flow modeling and RTL. Structural gate level description of decoder, equality detector, comparator, priority encoder, D-latch, D-ff, half adder, Full adder, Ripple Carry adder.

UNIT IV CMOS CHIP DESIGN 9

Logic design with CMOS: MOSFETS as switches, Basic logic gates in CMOS, Complex logic gates, Transmission gates: Muxes and latches, CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channelless and structured GA, Programmable logic structures; 22V10, Programming of PALs, ASIC design flow.

UNIT V CMOS TESTING 9

Need for testing, Design strategies for test, Chip level and system level test techniques.

TUTORIAL 15 **TOTAL : 60**

TEXT BOOKS

1. Weste & Eshraghian: Principles of CMOS VLSI design (2/e) Addison Wesley, 1993 for UNIT I through UNIT IV.
2. Samir Palnitkar; Verilog HDL – Guide to Digital design and synthesis, III edition, Pearson Education, 2003 for UNIT V

REFERENCES

1. M.J.S.Smith : Application Specific integrated circuits, Pearson Education, 1997.
2. Wayne Wolf, Modern VLSI Design, Pearson Education 2003.
3. Bob Zeidmin ; Introduction to verilog, Prentice Hall, 1999
4. J . Bhaskar : Verilog HDL Primer, BSP, 2002.

17152L55P **SEMESTER V**

OPTICAL COMMUNICATION AND MICROWAVE LAB **0 0 3 2**

Part I: Experiments pertaining to Fiber optics

1. Numerical aperture determination for fibers and Attenuation Measurement in Fibers.
2. Mode Characteristics of Fibers – SM Fibers.
3. Coupling Fibers to Semi-Conductor Sources – Connectors & Splices.
4. Fiber optic communication links.
5. LED & Photo Diode Characteristics.

Part II: Experiments pertaining to Microwave

1. VSWR Measurements – Determination of terminated impedance
2. Determination of guide wavelength, frequency measurement.
3. Radiation Pattern of Horns, Paraboloids.
4. Microwave Power Measurement.
5. Characteristics of Gunn diode Oscillator.

ELECTIVE- II

17158E54AP **SEMESTER V**

ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNIT:I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, Scope and importance − Need for public awareness − Forest resources −Water resources − Energy resources − Land resources − Role of an individual in conservation of natural resources − Equitable use of resource for sustainable life styles.

UNIT:II ECOSYSTEM AND BIODIVERSITY 9

Concept of an ecosystem − structure and Function of An ecosystem - Producers, consumers and decomposers − Energy flow in the ecosystem − Ecological succession − Food chains Food web and ecological pyramids. Introduction to Biodiversity − Value of Biodiversity − Biodiversity at global, National and local levels − India as a mega − diversity nation Hot spots of Biodiversity − Threats to Biodiversity Endangered and endemic species of India − Insitu and Excitu conservation of Biodiversity.

UNIT:III ENVIRONMENTAL POLLUTION 9

Definition − Causes, effects and control measure of **: -** Air pollution **-** Water Pollution **-** Soil Pollution **-** Marine Pollution **-** Noise Pollution **-**Thermal Pollution **-** Nuclear hazard − Solid Waste management − Role of Individual in prevention of pollution − Disaster management.

UNIT:IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From Un sustainable to sustainable development − water conservation,Rain water harvesting, water shed Management − Global warming − Ozone layer Depletion − Acid rain − Nuclear Accidents and holocaust − Environment Protection Act, Issues involved in enforcement legislation.

UNIT :V HUMAN POPULATION AND THE ENVIRONMENT 9

Population growth − Population explosion − Family welfare programme − Environment and human health − Human rights − value education − HIV/AIDS− Role of Information Technology in Environment and human health.

Total = 45

TEXT BOOK

1. Gilbert M Masters,“ Introduction to Environmental Engineering and science, ”Second Edition , Pearson Education Pvt, Ltd, 2007.

2. Miller T.G.Jr. “ Environmental science,”, Wadworth Publishing Co.

REFERENCES

1. Kurian Joseph, ”Essentials of Environmental studies”, First edition, Pearson Education, 2004.

BharuchaErach, “ The Biodiversity of India ,” Mapin Publishing Pvt,Ltd.

17152E54BP **SEMESTER V**

OPTO ELECTRONIC DEVICES **4 0 0 4**

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVE

- To know the basics of solid state physics and understand the nature and characteristics of light.
- To understand different methods of luminescence, display devices and laser types and their applications.
- To learn the principle of optical detection mechanism in different detection devices.
- To understand different light modulation techniques and the concepts and applications of optical switching.
- To study the integration process and application of opto electronic integrated circuits in transmitters and receivers.

UNIT I: ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light – Polarization – Interference – Diffraction – Light source – Review of quantum mechanical concept – Review of solid state physics – Review of semiconductor physics and semiconductor junction device.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction – Photo luminescence – Cathode luminescence – Electro luminescence – Injection luminescence – Injection luminescence – LED – Plasma display – Liquid Crystal Display (LCD) – Numeric displays – Laser emission – Absorption – Radiation – Population inversion – Optical feedback – Threshold condition – Laser modes – Classes of lasers – Mode locking – Laser applications.

UNIT III: OPTICAL DETECTION DEVICES 9

Photo detector – Thermal detector – Photo devices – Photo conductors – Photo diodes – Detector performance.

UNIT IV: OPTOELECTRONIC MODULATOR 9

Introduction – Analog and digital modulation – Electro-optic modulators – Magneto optic devices – Acoustoptic devices – Optical – Switching and logic devices.

UNIT V: OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction – Hybrid and monolithic integration – Application of opto electronic integrated circuits – Integrated transmitters and receivers – Guided wave devices.

Total: 45

TEXTBOOK

1. Wilson J and Haukes J., “Opto Electronics – An Introduction”, PHI Pvt. Ltd., 1995.

REFERENCES

1. Bhattacharya, “Semiconductor Opto Electronic Devices”, PHI Pvt Ltd., 1995.
2. Jasprit Singh, “Opto Electronics – As Introduction to Materials and Devices”, TMH International Edition, 1998.

17152E54CP **SEMESTER V**

RADAR AND NAVIGATIONAL AIDS **4 0 0 4**

AIM

To make the student understand the principles of Radar and its use in military and civilian environment

Also to make the student familiar with navigational aids available for navigation of aircrafts and ships.

OBJECTIVES

- To derive and discuss the Range equation and the nature of detection.
- To apply doppler principle to radars and hence detect moving targets, cluster, also to understand tracking radars
- To refresh principles of antennas and propagation as related to radars, also study of transmitters and receivers.
- To understand principles of navigation, in addition to approach and landing aids as related to navigation
- To understand navigation of ships from shore to shore.

UNIT I **INTRODUCTION TO RADAR** **9**

Basic radar – The simple form of the radar equation – Radar block diagram – Radar frequencies – Applications of radar – The origins of radar – The radar equation – Introduction – Detection of signals in noise – Receiver noise and the signal-to-noise ratio – Probability density functions – Probabilities of detection and false alarm – Integration of radar pulses – Radar cross section of targets – Radar cross section fluctuations – Transmitter power – Pulse repetition frequency – Antenna parameters – System losses – Other radar equation considerations

UNIT II: **MTI AND PULSE DOPPLER RADAR** **9**

Introduction to Doppler and MTI radar – Delay-line cancellers – Staggered pulse repetition frequencies – Doppler filter banks – Digital MTI processing – Moving target detector – Limitations to MTI performance – MTI from a moving platform (AMIT) – Pulse Doppler radar – Other Doppler radar topics – Tracking with radar – Mono pulse tracking – Conical scan and sequential lobing – Limitations to tracking accuracy – Low – Angle tracking – Tracking in range – Other tracking radar topics – Comparison of trackers – Automatic tracking with surveillance radars (ADT).

UNIT III **9**

Detection of signals in noise – Introduction – Matched – Filter receiver – Detection – Detectors – Automatic detector – Integrators – Constant – False – Alarm rate receivers – The radar operator – Signal management – Propagation radar waves – Atmospheric – Standard propagation – Nonstandard propagation – The radar antenna – Reflector antennas – Electronically steered phased array antennas – Phase shifters – Frequency – Scan arrays – Radar transmitters – Introduction – Linear beam power tubes – Solid state RF power sources – Magnetron – Crossed field amplifiers – Other RF power sources – Other aspects of radar transmitter – Radar receivers – The radar receiver – Receiver noise figure – Super heterodyne receiver – Duplexers and receiver protectors – Radar displays.

UNIT IV **9**

Introduction – Four methods of navigation – Radio direction finding – The loop antenna – Loop input circuits – An aural null direction finder – The goniometer – Errors in direction finding – Adcock direction finders – Direction finding at very high frequencies – Automatic direction finders – The commutated aerial direction finder – Range and accuracy of direction finders – Radio ranges – The Lf/Mf four course radio range – Vhf omni directional range (Vor) – Vor receiving equipment – Range and accuracy of Vor – Recent developments – Hyperbolic systems of navigation (loran and decca) – Loran-A equipment – Range and precision of standard loran – Loran-C – The decca navigation system – Decca receivers – Range and accuracy of decca – The omega system

UNIT V **9**

DME and TACAN – Distance measuring equipment – Operation of DME – TACAN – TACAN equipment – Aids to approach and landing – Instrument landing system – Ground controlled approach system – Microwave Landing System (MLS) – Doppler navigation – The Doppler effect – Beam configurations – Doppler frequency equations – Track stabilization – Doppler spectrum – Components of the Doppler navigation system – Doppler range equation – Accuracy of Doppler navigation systems –Inertial navigation – Principles of operation – Navigation over the earth – Components of an inertial navigation system – Earth co-ordinate mechanization – Strapped – Down systems – Accuracy of inertial navigation systems – Satellite navigation system – The transit system – Navstar Global Positioning System (GPS)

Total: 45

TEXTBOOK

1. Merrill I. Skolnik , "Introduction to Radar Systems", 3rd Edition, TMH, 2003

REFERENCES

1. Peyton Z. Peebles, "Radar Principles", John wiley, 2004
2. Toomay J.C, "Principles of Radar", 2nd Edition, PHI, 2004

17152E54DP **SEMESTER V**

DIGITAL IMAGE PROCESSING **4 0 0 4**

AIM

To introduce the student to various image processing techniques.

OBJECTIVES

- To study the image fundamentals and mathematical transforms necessary for image processing.
- To study the image enhancement techniques
- To study image restoration procedures.
- To study the image compression procedures.
- To study the image segmentation and representation techniques.

UNIT - I: DIGITAL IMAGE FUNDAMENTALS **9**

Elements of visual perception – Image sampling, Quantization – Basic relationship between pixels- monochrome vision model- color space model-convolution.

UNIT – II IMAGE TRANSFORM **9**

Basic geometric transforms-Introduction to Fourier transform and DFT – properties of 2d Fourier transform – FFT- Separable image transforms – Walsh – Hadamard- Discrete cosine and Haar Transfroms

UNIT-III:IMAGE ENHANCEMENT AND RESTORATION TECHNIQUES **9**

Spatial domain methods- Basic gray level transformation-Histogram equalization-Spatial filtering-Laplacian filtering- Frequency Domain filters- homomorphic filtering-Model of image degradation/Restoration process- Noise models.

UNIT IV:IMAGE COMPRESSION **9**

Lossless compression-: Variable length coding- LZW coding- -Predictive coding-DPCM. Lossy compression- Transform coding-– Image compression standards-JPEG,MPEG.

UNIT – V:IMAGE SEGMENTATION & REPRESENTATION 9

Edge detection – Thresholding- region based segmentation- Boundary representation – chair codes- Boundary segments – boundary descriptors-: simple descriptors-Fourier descriptors- Regional descriptors- Texture.

TOTAL : 45

Text Book:

Rafeel C. Gonzalez,Richard E woods 2nd edition – Digital Image processing – Pearson education 2003.

Reference books:

1. William K.Pratt, Digital Image processing, John Wiley (2001)
2. Image processing Analysis and Machine Vision - Millman Sonka ,Vaclav hlavac,Roger Boyle,Broos/Colic,Thompson Learnfy(1999)
3. A.K.Jain PHI,(1995) – Fundamentals of Digital Image processing

17152E54EP **SEMESTER V**

ENGINEERING ACOUSTICS **4 0 0 4**

AIM

This course aims at providing an overview of engineering acoustics.

OBJECTIVE

- To provide mathematical basis for acoustics waves
- To introduce the concept of radiation reception absorption and attenuation of acoustic waves.
- To present the characteristic behaviour of sound in pipes, resonators and filters.
- To introduce the properties of hearing and speech
- To describe the architecture and environmental inclusive of reverberation and noise.
- To give a detailed study on loud speakers and microphones.

UNIT I:

Acoustics waves – Linear wave equation – Sound in fluids – Harmonic plane waves – Energy density – Acoustics intensity – Specific acoustic impedance – Spherical waves – Describer scales.

Reflection and Transmission: Transmission from one fluid to another normal and oblique incidence – Method of images.

UNIT II: RADIATION AND RECEPTION OF ACOUSTIC WAVES 9

Radiation from pulsating sphere – Acoustic reciprocity – Continuous line source – Radiation impedance – Fundamental properties of transducers.

Absorption and attenuation of sound: Absorption from viscosity – Complex sound speed and absorption – Classical absorption co-efficient

UNIT III: PIPE RESONATORS AND FILTERS 9

Resonance in pipes – Standing wave pattern absorption of sound in pipes – Long wavelength limit – Helmoltz resonator – Acoustic impedance – Reflection and transmission of waves in pipe – Acoustic filters – Low pass, high pass and band pass.

Noise, Signal detection, Hearing and speech: Noise, spectrum level and band level – Combing band levels and tones – Detecting signals in noise – Detection threshold – The ear – Fundamental properties of hearing – Loudness level and loudness – Pitch and frequency – Voice.

UNIT IV: ARCHITECTURAL ACOUSTICS 9

Sound in endosure – A simple model for the growth of sound in a room – Reverberation time – Sabine, sound absorption materials – Measurement of the acoustic output of sound sources in live rooms – Acoustics factor in architectural design.

Environmental Acoustics: Weighted sound levels speech interference – Highway noise

1. Noise induced hearing loss – Noise and architectural design specification and measurement of some isolation design of portions.

UNIT V: TRANSDUCTION 9

Transducer as an electives network – Canonical equation for the two simple transducers transmitters – Moving coil loud speaker – Loudspeaker cabinets – Horn loud speaker, receivers – Condenser – Microphone – Moving coil electrodynamics microphone Piezoelectric microphone – Calibration of receivers.

Total: 45

TEXT BOOK

2. Lawerence E. Kinsler, Austin R. Frey, Alan B. Coppens and James V. Sanders, "Fundamentals of Acoustics", 4th Edition, Wiley, 2000.

REFERENCE

1.Berarek L., "Acoustics", TMH, 2002.

17152H61P **SEMESTER VI**

MOBILE AND WIRELESS COMMUNICATION **4 0 0 4**

AIM

To introduce the concepts of wireless / mobile communication using cellular environment. To make the students to know about the various modulation techniques, propagation methods, coding and multi access techniques used in the mobile communication. Various wireless network systems and standards are to be introduced.

Objectives

- It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall capacity of cellular systems.
- It presents different ways to radio propagation models and predict the large – scale effects of radio propagation in many operating environment. This also covers small propagation effects such as fading, time delay spread and Doppler spread and describes how to measures and model the impact that signal bandwidth and motion have on the instantaneous received signal through the multi-path channel.
- It provides idea about analog and digital modulation techniques used in wireless communication. It also deals with the different types of equalization techniques and diversity concepts.
- It provides an introduction to speech coding principles which have driven the development of adaptive pulse code modulation and linear predictive coding techniques are presented. This unit also describes the time, frequency code division multiple access techniques as well as more recent multiple access technique such as space division multiple access.
- It deals with second generation and third generation wireless networks and worldwide wireless standards.

UNIT I: PRINCIPLES OF WIRELESS COMMUNICATION 10

Digital modulation techniques – Linear modulation techniques – Spread spectrum modulation – Performance of modulation – Multiple access techniques – TDMA – FDMA – CDMA – SDMA – Overview of cellular networks – Cellular concept – Handoff strategies – Path loss – Fading and Doppler effect.

UNIT II: WIRELESS PROTOCOLS 11

Issues and challenges of wireless networks – Location management – Resource management – Routing – Power management – Security – Wireless media access techniques – ALOHA – CSMA – Wireless LAN – MAN – IEEE 802.11 (a–b–e–f–g–h–i) – Bluetooth. Wireless routing protocols – Mobile IP – IPv4 – IPv6 – Wireless TCP. Protocols for 3G & 4G cellular networks – IMT – 2000 – UMTS – CDMA2000 – Mobility management and handover technologies – All-IP based cellular network

UNIT III: TYPES OF WIRELESS NETWORKS 9

Mobile networks – Ad-hoc networks – Ad-hoc routing – Sensor networks – Peer-Peer networks – Mobile routing protocols – DSR – AODV – Reactive routing – Location aided routing – Mobility models – Entity based – Group mobility – Random way – Point mobility model.

UNIT IV: ISSUES AND CHALLENGES 9

Issues and challenges of mobile networks – Security issues – Authentication in mobile applications – Privacy issues – Power management – Energy awareness computing. Mobile IP and Ad-hoc networks – VoIP applications.

UNIT V: SIMULATION 6

Study of various network simulators (GloMoSim – NS2 – Opnet) – Designing and evaluating the performance of various transport and routing protocols of mobile and wireless networks using network simulator (any one).

Total: 45

REFERENCES

1. Theodore S. Rappaport, “Wireless Communications, Principles and Practice”, Prentice Hall, 1996.
2. Stallings W., “Wireless Communications & Networks”, Prentice Hall, 2001.
3. Schiller J., “Mobile Communications”, Addison Wesley, 2000.
4. Lee W. C. Y., “Mobile Communications Engineering: Theory and Applications”, 2nd Edition, TMH, 1997.
5. Pahlavan K. and Krishnamurthy P., “Principles of Wireless Networks”, Prentice Hall, 2002.
6. Black U. D., “Mobile and Wireless Networks”, PHI, 1996.
7. Charles E. Perkins, “Ad – Hoc Networking”, Addison – Wesley, December 2000
8. IEEE Journals and Proceedings

MEDICAL ELECTRONICS 4 1 0 4

AIM

To make students to understand the applications of electronics in diagnostic and therapeutic area.

OBJECTIVE

- To study the methods of recording various biopotentials
- To study how to measure biochemical and various physiological information
- To understand the working of units which will help to restore normal functioning
- To understand the use of radiation for diagnostic and therapy
- To understand the need and technique of electrical safety in Hospitals

UNIT I ELECTRO– PHYSIOLOGY AND BIO– POTENTIAL RECORDING 9

The origin of bio-potentials – Bio-potential electrodes – Biological amplifiers – ECG – EEG – EMG – PCG – EOG – Lead systems and recording methods – Typical waveforms and signal characteristics.

UNIT II BIO– CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

PH – PO2 – PCO2 – PHCO3 – Electrophoresis – Colorimeter – Photometer – Auto analyzer – Blood flow meter – Cardiac output – Respiratory measurement – Blood pressure – Temperature – Pulse – Blood cell counters.

UNIT III ASSIST DEVICES AND BIO– TELEMETRY 9

Cardiac pacemakers – DC defibrillator – Telemetry principles – Frequency selection – Bio-telemetry – Radio – Pill and tele-stimulation.

UNIT IV RADIOLOGICAL EQUIPMENTS 9

Ionosing radiation – Diagnostic X-ray equipments – Use of radio isotope in diagnosis – Radiation therapy.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Thermo graph – Endoscopy unit – Laser in medicine – Diathermy units – Electrical safety in medical equipment.

TUTORIAL 15 **TOTAL: 60**

TEXTBOOK

1. Leislie Cromwell, “Biomedical Instrumentation and Measurement”, PHI, 2002.

REFERENCES

1. Khandpur R.S., “Handbook of Biomedical Instrumentation”, TATA McGraw-Hill, 1997.
2. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, John Wiley and Sons, 1997.

17152H63P **SEMESTER VI**

MICRO CONTROLLER AND EMBEDDED SYSTEMS 4 1 0 4

Aim

To make students familiar about microcontroller, programming and its applications.

Objective

- To study 8051 architecture
- To write assembly language programming
- To study the embedded architecture and real time applications.

UNIT I 8051 MICROCONTROLLER 9

8051 Micro controller hardware- I/O pins, ports and circuits- External memory –Counters and Timers-Serial Data I/O- Interrupts-

UNIT II 8051 PROGRAMMING AND APPLICATIONS 9

8051 instruction set – Addressing modes – Assembly language programming – I/O port programming -Timer and counter programming – Serial Communication – Interrupt programming –8051 Interfacing:, Stepper Motors,.

UNIT III INTRODUCTION TO EMBEDDED SYSTEMS 9

Definition and Classification – Overview of Processors and hardware units in an embedded system – Software embedded into the system – Exemplary Embedded Systems – Embedded Systems on a Chip (SoC)

UNIT IV DEVICES AND BUSES FOR DEVICES NETWORK 9

I/O Devices - Device I/O Types– Synchronous - Iso-synchronous and Asynchronous Communications from Serial Devices -Communication Devices - UART and HDLC - Parallel Port Devices - Timer and Counting Devices - ‘12C’, ‘CAN’ - I/O Serial high speed buses- ISA,

UNIT V EMBEDDED ARCHITECTURE 9

Embedded computers, characteristics of embedded, computing applications- challenges in embedded computing systems design, embedded design process, requirements and specifications, architectural design

TUTORIAL 15 **TOTAL : 60**

TEXT BOOKS

1. Ramesh S.Gaonkar, "Microprocessor - Architecture, Programming and Applications with the 8085", Penram International publishing private limited, fifth edition.
2. A.K. Ray & K.M.Bhurchandi, "Advanced Microprocessors and peripherals- Architectures, Programming and Interfacing", TMH, 2002 reprint.
3. Rajkamal, Embedded Systems Architecture, Programming and Design, TATA McGraw-Hill, First reprint Oct. 2003

REFERENCES

1. Douglas V.Hall, "Microprocessors and Interfacing: Programming and Hardware", TMH, Third edition
2. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", PHI 2003
3. Mohamed Ali Mazidi, Janice Gillispie Mazidi, "The 8051 microcontroller and embedded systems", Pearson education, 2004.
4. Steve Heath, Embedded Systems Design, Second Edition-2003, Newnes,
5. David E.Simon, An Embedded Software Primer, Pearson Education Asia, First Indian Reprint 2000.
6. Wayne Wolf, Computers as Components; Principles of Embedded Computing System Design – Harcourt India, Morgan Kaufman Publishers, First Indian Reprint 2001

VLSI AND EMBEDDED SYSTEMS LAB 0 0 3 2

PART –I: VLSI LAB

1. Study of Simulation using tools using Digital Logic Circuits.
2. Study of Synthesis tools using Digital Logic Circuits.
3. Study of development tool for FPGA using Verilog and Schematic Entry.
4. Design and Simulation of 8bit Signed Multiplier.
5. Place and Root and back annotation for FPGA.

PART-II: EMBEDDED LAB

1. Programming using Arithmetic, instruction of 8051microcontroller.
2. Programming and verifying Timer operations in 8051 microcontroller.
3. ARM-7 based On board LED testing
4. ARM 7 Based ADC testing
5. ARM 7 based DAC testing

ELECTIVE -III

17160E64AP **SEMESTER VI**

PRINCIPLES OF MANAGEMENT

(Common to all Branches) **4-0-0-4**

UNIT I - Nature of Management

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

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

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

UNIT III - Planning and organizing **9**

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

UNIT IV - Direction and Coordination **9**

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

UNIT V – Controlling **9**

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

TOTAL : 45

Textbooks:

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

References:

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

17152E64BP **SEMESTER VI**

SATELLITE COMMUNICATION **4 0 0 4**

AIM

To enable the student to become familiar with satellites and satellite services.

OBJECTIVES

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

UNIT I : ELEMENTS OF ORBITAL MECHANICS **9**

Equation of motion – Orbital elements – Orbital perturbation – Tracking and orbit determination – orbit control.
Satellite Launch systems: Fundamentals of Rocket propulsion – Multistage rockets – Huffman transfer orbit circularization

UNIT II: ELEMETS OF COMMUNICATION SATELLITE DESIGN **9**

Space environment – Spacecraft configuration – Spacecraft subsystems – Payload – Reliability consideration – Spacecraft integration – Testing facilities – Spacecraft operations.

UNIT – III : SATELLITE COMMUNICATION SYSTEMS **9**

Types of systems – FSS,BSS- Noise interference ,inter modulation –CDMA- Packet satellite networks – The INSAT system - The INTELSAT/INMARSAT system.

UNIT – IV:EARTH STATION DESIGN **9**

Earth station configuration option – Site selection – Antenna systems – Tracking systems – Receiver subsystems – Low noise amplifiers – Down converters – Transmitter subsystems – Up converters- High power amplifiers - Terminal equipment .

UNIT - V: PERFORMANCE MEASUREMENTS 9

Spacecraft checkout – Ground station measurements –System coordination and control .Elements of Frequency coordination and management : The ITU/IFRB requirements – Satellite system characterization – Ground system characteristics .

TOTAL : 45

Text book:

1. B.N.AGARWAL :Deign of Geosynchronous spacecraft, Prentice Hall

Reference Books:

1. R.F.FILIPOWASKY and E.K.MUCHIDORF: Space communication Systems ,Mcgraw Hill
2. DENNIS RODDY – Satellite communication
3. K.MIYA :Satellite communication technology – Lattice and company

17152E64CP **SEMESTER VI**

ROBOTICS **4 0 0 4**

AIM

Robots are slowly and steadily replacing human beings in many fields. The aim of this course is to introduce the students into this area so that they could use the same when they enter the industries.

OBJECTIVES

- The course has been so designed to give the students an overall view of the mechanical components and mathematics associated with the same.
- Actuators and sensors necessary for the functioning of the robot.

UNIT I: ROBOT ORGANIZATION 9

Coordinate transformation, kinematics and inverse kinematics – Trajectory planning and remote manipulation.

UNIT II: ROBOT HARDWARE 9

Robot sensors – Proximity sensors – Range sensors – Visual sensors – Auditory sensors – Robot manipulators – Manipulator dynamics – Manipulator control – Wrists – End efforts – Robot grippers.

UNIT III: ROBOT AND ARTIFICIAL INTELLIGENCE 9

Principles of AI – Basics of learning – Planning movement – Basics of knowledge representations – Robot programming languages.

UNIT IV: ROBOTIC VISION SYSTEMS 9

Principles of edge detection – Determining optical flow and shape – Image segmentation – Pattern recognition – Model directed scene analysis.

UNIT V: ROBOT CONTROL AND APPLICATION 9

Robot control using voice and infrared – Overview of robot applications – Prosthetic devices – Robots in material handling, processing assembly and storage.

Total: 45

REFERENCES

1. Koren, “Robotics for Engineers”, TMH International Company, 1995.
2. Vokopravotic, “Introduction to Robotics”, Springer, 1988.
3. Rathmill K., “Robot Technology and Application”, Springer, 1985.
4. Charniak and Mc Darmott, “Introduction to Artificial Intelligence”, TMH, 1986.
5. Fu K.S, Gonzally R.C, Lee C.S.G., “Robotics Control, Sensing, Vision and Intelligence”, TMH Book Company, 1997.
6. Barry Leatham and Jones, “Elements of Industrial Robotics”, Pittman Publishing, 1987.
7. Mikell P. Groover, Mitchell Weiss, Roger N. Nagel, Nicholas G. Odrey, “Industrial Robotic Technology Programming and Applications”, TMH Book Company, 1986.
8. Bernard Hodges and Paul Hallam, “Industrial Robotics”, British Library Cataloguing Publication, 1990.

17152E64DP **SEMESTER VI**

REMOTE SENSING **4 0 0 4**

AIM:

To understand the basics for REMOTE SENSING

OBJECTIVES:

- Introduce the principles of remote sensing and fundamental knowledge on the physics of remote sensing, aerial photographic techniques, photogrammetry, multispectral, hyperspectral and thermal imaging, and RADAR and LIDAR image analysis.
- The newest technology in the field will also be discussed.
- The course will be taught with an emphasis on the geographical applications of remote sensing; however, in certain instances other disciplines will be introduced as well.

UNIT I : REMOTE SENSING 9

Definition – Components of Remote Sensing - Energy, Sensor, Interacting Body – Active and Passive Remote Sensing – Platforms – Aerial and Space Platforms – Balloons, Helicopters, Aircraft and Satellites – Synoptivity and Repetivity – Electro Magnetic Radiation (EMR) – EMR spectrum – Visible, Infra Red (IR), Near IR, Middle IR, Thermal IR and Microwave – Black Body Radiation – Planck's law – Stefan-Boltzman law.

UNIT II: EMR INTERACTION WITH ATMOSPHERE AND EARTH MATERIALS 9

Atmospheric characteristics – Scattering of EMR – Raleigh, Mie, Non-selective and Raman Scattering – EMR Interaction with Water vapour and ozone – Atmospheric Windows – Significance of Atmospheric windows – EMR interaction with Earth Surface Material – Radiance, Irradiance, Incident, Reflected, Absorbed and Transmitted Energy – Reflectance – Specular and Diffuse Reflection Surfaces – Spectral Signature – Spectral Signature curves – EMR interaction with water, soil and Earth Surface: Imaging spectrometry and spectral characteristics.

UNIT – III : OPTICAL AND MICROWAVE REMOTE SENSING 9

Satellites – Classification – Based on Orbits and purpose – Satellite Sensors – Resolution – Description of Multi Spectral Scanning – Along and Across Track Scanners – Description of Sensors in Land sat, SPOT, IRS series – Current Satellites – Radar Speckle – Back Scattering – Side Looking Airbome Radar – Synthetic Aperture Radar – Radiometer – Geometrical characteristics ; Sonar remote sensing systems.

UNIT – IV: GEOGRAPHIC INFORMATION SYSTEM 9

GIS – Components of GIS – Hardware, Software and Organisational Context – Data – Spatial and Non-Spatial – Maps – Types of Maps – Projection – Types of Projection – Data Input – Digitizer, Scanner – Editing – Raster and Vector data structures – Comparition of Raster and Vector data structure – Analysis using Raster and Vector data –Retrieval, Reclassification, Overlaying, Buffering – Data Output – Printers and Plotters.

UNIT - V: MISCELLANEOUS TOPICS 9

Visual Interpretation of Satellite Images – Elements of Interpretation – Interpretation Keys Characteristics of Digital Satellite Image –Image enhancement – Filtering – Classification – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Urban Applications – Integration of GIS and Remote Sensing – Application of Remote Sensing and GIS – Water resources – Urban Analysis – Watershed Management – Resources Information Systems. Global positioning system – an introduction.

TOTAL : 45 PERIODS

TEXT BOOK:

1. M.G. Srinivas(Edited By), Remote Sensing Applications, Narosa Publishing House, 2001. (Units 1& 2).
2 Anji Reddy, Remote Sensing and Geographical Information Systems, BS Publications 2001 (Units 3, 4, & 5).

REFERENCE BOOKS:

3. Jensen, J.R., Remote Sensing of the environment, Prentice Hall, 2000.
4. Kang-Tsung Chang, "Introduction to Geographic Information Systems" , TMH, 2002
5. Lillesand T.M. and Kiefer R.W., "Remote Sensing and Image Interpretation", John Wiley and Sons, Inc, New York, 1987.
6. Burrough P A, "Priciples of GIS for land resource assessment", Oxford
7. Mischael Hord, "Remote Sensing and Methods and Applications" , John Wiley & Sons, New York, 1986.
8. Signal, "Remote Sensing", Tata McGraw-Hill, NewDelhi, 1990.
9. Floyd F. Sabins, Remote Sensing, "Priciples and interpretation", W H Freeman and Company 1996.

17150E64EP **SEMESTER VI**

NETWORK SECURITY **4 0 0 4**

AIM

To understand the principles of encryption algorithms; conventional and public key cryptography. To have a detailed knowledge about authentication, hash functions and application level security mechanisms.

OBJECTIVES

- To know the methods of conventional encryption.
- To understand the concepts of public key encryption and number theory
- To understand authentication and Hash functions
- To know the network security tools and applications.
- To understand the system level security used.

UNIT I: SYMMETRIC CIPHERS 9

Overview – Classical encryption techniques – Block ciphers and data encryption standard – Finite fields – Advanced encryption standard – Contemporary symmetric ciphers – Confidentiality using symmetric encryption.

UNIT II: PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9

Number theory – Public-key cryptography and RSA – Keym – Diffie-hellman key exchange – Elliptic curve cryptography – Message authentication and hash functions – Hash algorithms – Digital signatures and authentication protocols.

UNIT III: NETWORK SECURITY PRACTICE 9

Authentication applications – Kerberos-X.509 authentication service – Electronic mail security – Pretty good privacy – S/MIME – IP security – IP security architecture – Authentication header – Encapsulating security payload – Key management.

UNIT IV: SYSTEM SECURITY 9

Intruders – Intrusion detection – Password management – Malicious software – Firewalls – Firewall design principles – Trusted systems.

UNIT V: WIRELESS SECURITY 9

Wireless LAN security standards – Wireless LAN security factors and issues.

Total: 45

TEXT BOOK

1. William Stallings, “Cryptography and Network Security – Principles and Practices”, 3rd Edition, Pearson Education, 2003.

REFERENCES

1. Atul Kahate, “Cryptography and Network Security”, 2nd Edition, TMH, 2007.
2. Bruce Schneier, “Applied Cryptography”, 2nd Edition, John Wiley and Sons Inc, 2001.
3. Stewart S. Miller, “Wi-Fi Security”, TMH, 2003.
4. Charles B. Pfleeger and Shari Lawrence Pfleeger, “Security in Computing”, 3rd Edition, Pearson Education, 2003.

17160S71P **SEMESTER VII**

TOTAL QUALITY MANAGEMENT **4 0 0 3**

OBJECTIVE

- To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
- To understand the statistical approach for quality control.
- To create an awareness about the ISO and QS certification process and its need for the industries.

1. INTRODUCTION **9**

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

2. TQM PRINCIPLES **9**

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy, Performance Measure.

3. STATISTICAL PROCESS CONTROL (SPC) **9**

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

4. TQM TOOLS **9**

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.

5. QUALITY SYSTEMS **9**

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, TS 16949, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOK

1. Dale H.Besterfiled, et al., Total Quality Management, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.

REFERENCES

1. James R.Evans & William M.Lidsay, The Management and Control of Quality, (5th Edition), South-Western (Thomson Learning), 2002 (ISBN 0-324-06680-5).
2. Feigenbaum.A.V. "Total Quality Management, McGraw-Hill, 1991.
3. Oakland.J.S. "Total Quality Management Butterworth – Hcinemann Ltd., Oxford. 1989.
4. Narayana V. and Sreenivasan, N.S. Quality Management – Concepts and Tasks, New Age International 1996.
5. Zeiri. "Total Quality Management for Engineers Wood Head Publishers, 1991

17152H72P **SEMESTER VII**

WIRELESS NETWORKS **4 1 0 4**

AIM

To study some fundamental concepts in wireless networks.

OBJECTIVES

- To understand physical as wireless MAC layer alternatives techniques.
- To learn planning and operation of wireless networks.
- To study various wireless LAN and WAN concepts.
- To understand WPAN and geo-location systems.

UNIT I: PHYSICAL AND WIRELESS MAC LAYER ALTERNATIVES 9

Wired transmission techniques: Design of wireless modems – Power efficiency – Out of band radiation – Applied wireless transmission techniques – Short distance base band transmission – VWB pulse transmission – Broad modems for higher speeds – Diversity and smart receiving techniques – Random access for data oriented networks – Integration of voice and data traffic.

UNIT II: WIRELESS NETWORK PLANNING AND OPERATION 9

Wireless networks topologies – Cellular topology – Cell fundamentals signal to interference ratio calculation – Capacity expansion techniques – Cell splitting – Use of directional antennas for cell sectoring – Micro cell method – Overload cells – Channels allocation techniques and capacity expansion FCA – Channel borrowing techniques – DCA – Mobility management – Radio resources and power management securities in wireless networks.

UNIT III: WIRELESS WAN 9

Mechanism to support a mobile environment – Communication in the infrastructure – IS-95 CDMA forward channel – IS-95 CDMA reverse channel – Pallert and frame formats in IS-95, IMT-2000 – Forward channel in W-CDMA and CDMA-2000 – Reverse channels in W-CDMA and CDMA-2000 – GPRS and higher data rates – Short Messaging Service in GPRS mobile application protocols.

UNIT IV: WIRELESS LAN 9

Historical overviews of the LAN industry – Evolution of the WLAN industry – Wireless Home Networking – IEEE 802.11 – The PHY layer – MAC layer – Wireless ATM –

HYPER LAN – HYPER LAN – 2.

UNIT V: WPAN ANDGEOLOCATION SYSTEMS 9

IEEE 802.15 WPAN – Home RF – Bluetooth – Interface between luetooth and 802.11 – Wireless geolocation technologies for wireless geolocation – Geolocation standards for E.911 service.

Tutorial:15 Total: 60

TEXT BOOK

1. Kaveh Pahlavan, Prashant Krishnamoorthy, “Principles of Wireless Networks, – A United Approach”, Pearson Education, 2002.

REFERENCES

1. Jochen Schiller, “Mobile Communications”, 2nd Edition, Person Education, 2003.
2. Wang X. and Poor H.V., “Wireless Communication Systems”, Pearson Education, 2004.
3. Mallick M., “Mobile and Wireless Design Essentials”, Wiley Publishing Inc. 2003.
4. Nicopolitidis P, Obaidat M.S, Papadimitria G.I, Pomportsis A.S., “Wireless Networks”, John Wiley and Sons, 2003.

17152H73P **SEMESTER VII**

TELECOMMUNICATION SWITCHING AND NETWORKS 4 0 0 4

AIMS

- To introduce fundamentals functions of a telecom switching office, namely, digital multiplexing, digital switching and digital subscriber access.
- To introduce a mathematical model for the analysis of telecommunication traffic.

OBJECTIVES

- To introduce the concepts of Frequency and Time division multiplexing.
- To introduce digital multiplexing and digital hierarchy namely SONET / SDH
- To introduce the concepts of space switching, time switching and combination switching, example of a switch namely No.4 ESS Toll switch.
- To introduce the need for network synchronization and study synchronization issues. To outline network control and management issues.
- To study the enhanced local loop systems in digital environment. To introduce ISDN, DSL / ADSL, and fiber optic systems in subscriber loop.
- To introduce statistical modeling of telephone traffic. To study blocking system characteristics and queuing system characteristics.
- To characterize blocking probability holding service time distributions for in speech and data networks.

UNIT I EVOLUTION OF TELECOMMUNICATION SWITCHING AND CIRCUITS 9

Evolution of Public Switched Telecommunication Networks Strowger exchange, Crossbar exchange,– Basic Tele communication equipments – Telephone handset, , Echo suppressors and cancellors, PCM coders, Modems and Relays.

UNIT II ELECTRONIC SWITCHING 9

Circuit Switching, Message switching, Centralized stored programme switching, Time switching, Space switching,– Digital switching system hardware configuration,

UNIT III TELECOMMUNICATION SIGNALLING AND TRAFFIC 9

Channel associated signaling, Common channel signaling, SS7 signaling protocol, SS7 protocol architecture, , Grade of service, Modeling switching systems, Blocking models and Delay systems.

UNIT IV INTEGRATED DIGITAL NETWORKS 9

Subscriber loop characteristics, Local access wire line and wire less PCM / TDM carrier standards transmission line codes, Synchronous, Asynchronous, SONET / SDH, Integrated Digital Network (IDN) environment – Principles of Integrated Services Digital Network (ISDN) –

UNITV DATA NET WORKS 9

Data transmission in PSTN – Connection oriented and Connection less protocols – packet switching – ISO-OSI architecture-Satellite based data networks –LAN, WAN – standards – TCP / IP – Internet –

TOTAL : 45

TEXT BOOKS:

1. Viswanathan. T, "Telecommunication Switching System and Networks", Prentice Hall of India Ltd., 1994.
2. Behrouz Forouzan, "Introduction to Data Communication and Networking", McGraw-Hill, 1998.

REFERENCES

1. L.S.Lawton, "Integrated Digital Networks, Galgotta Publication Pvt., Ltd., New Delhi,1996.
2. Syed R. Ali, "Digital Switching Systems", McGraw-Hill Inc., New York, 1998.

ELECTIVE – IV

17152E74AP **SEMESTER VII**

POWER ELECTRONICS **4 0 0 3**

AIM

Application of Electronic knowledge in industry for rectification of polyphase supply voltage and for control of motor speed and for thermal heating.

OBJECTIVES

- To study about power electronic circuits for voltage and current control and protection.
- To learn the switching characteristics of transistors and SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR.
- To learn controlled rectification AC supplies.
- To study of converters and inverters.
- To learn about motor control, charges, SMPS and UPS.

UNIT I POWER SEMICONDUCTOR DEVICES 9

Power transistors, Thyristors, Power TRIAC, MOSFET, IGBT, GTO characteristics, rating, Protection circuits,.

UNIT II POWER SUPPLIES 9

Single Phase and Three Phase Controlled rectifiers, Design of Trigger circuits, Switching mode regulators – Boost, Buck, Buck-Boost and Cuk regulators, AC voltage regulator.

UNIT III INVERTERS 9

Voltage and current source inverters, Resonant, Series inverter, PWM inverter.

UNIT IV CHOPPERS 9

Type A, B, C and D choppers, Pulse width modulation - Gating requirements.

UNIT V MOTOR CONTROL & Applications 9

Single Phase DC series motor drives, Induction and Synchronous motor drives, Switched reluctance motor Drive, SMPS and UPS

TOTAL: 45

TEXT BOOK:

1. M.D.Singh, K.B. Khanchandani, "Power Electronics", Tata McGraw-Hill, 1998.

REFERENCES:

1. Ned Mohan, Tore M.Undeland, William P.Robbins, "Power Electronics, Converters, Applications and Design", John Wiley & Sons, 1994.
2. Muhamed H.Roshid, "Power Electronics Circuits, Devices and Application", Prentice Hall of India, 1995.
3. B.K.Bose, "Modern Power Electronics", Jaico Publishing House, 1999.
4. Sen, Power Electronics", Tata McGraw-Hill, 1987

17152E74BP **SEMESTER VII**

ADVANCED MICROPROCESSORS **4 0 0 3**

AIM

To learn the architecture and programming of advanced Intel family microprocessors and microcontrollers.

OBJECTIVES

- To introduce the concepts in internal programming model of Intel family of microprocessors.
- To introduce the programming techniques using MASM, DOS and BIOS function calls.
- To introduce the basic architecture of Pentium family of processors.
- To introduce the architecture programming and interfacing of 16 bit microcontrollers.
- To introduce the concepts and architecture of RISC processor and ARM.

UNIT I ADVANCED MICROPROCESSOR ARCHITECTURE 9

Internal microprocessor architecture – Real mode memory addressing – Protected mode memory addressing – Memory paging – Data addressing modes – Program memory addressing modes – Stack memory addressing modes – Data movement instructions – Program control instructions – Arithmetic and logic instructions.

UNIT II MODULAR PROGRAMMING AND ITS CONCEPTS 9

Modular programming – Using keyboard and video display – Data conversions – Disk files – Interrupt hooks – Using assembly languages with C/ C++

UNIT III PENTIUM PROCESSORS 9

Introduction to pentium microprocessor – Special pentium registers – Pentium memory management – New pentium instructions – Pentium processor – Special pentium pro features – Pentium IV processor

UNIT IV 16– BIT MICRO CONTROLLER 9

8096/8097 architecture – CPU registers – RALU – Internal program and data memory timers – High speed input and output – Serial interface – I/O ports – Interrupts – A/D converter – Watch dog timer – Power down feature – Instruction set – External memory interfacing – External I/O interfacing.

UNIT V RISC PROCESSORS AND ARM 9

The RISC revolution – Characteristics of RISC architecture – The berkeley RISC – Register windows – Windows and parameter passing – Window overflow – RISC architecture and pipelining – Pipeline bubbles – Accessing external memory in RISC systems – Reducing the branch penalties – Branch prediction – ARM processors – ARM registers – ARM instructions – ARM built-in shift mechanism – ARM branch instructions – Sequence control – Data movement and memory reference instructions.

TOTAL: 45

TEXT BOOKS

1. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80, 86, 80286, 80386 80486, Pentium, Pentium Pro Processor, Pentium II, Pentium III, Pentium 4, Architecture, Programming and Interfacing", PHI Private Limited, 2003.
2. John Peatman, "Design with Microcontroller", TMH Publishing Co Ltd, 2003.
3. Alan Clements, "The Principles of Computer Hardware", 3rd Edition, Oxford University Press, 2003.

REFERENCES

1. Rajkamal, "The Concepts and Feature of Micro Controllers 68HC11, 8051 and8096", S Chand Publishers, 2000.

17152E74CP **SEMESTER VII**

ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY 4 0 0 3

AIM

To understand different electromagnetic Interference problems occurring in Intersystem and in inter system and their possible mitigation techniques in Electronic design

OBJECTIVES

- To understand EMI Sources, EMI problems and their solution methods in PCB level / Subsystem and system level design.
- To measure the emission. immunity level from different systems to couple with the prescribed EMC standards

UNIT I BASIC CONCEPTS 9

Definition of EMI and EMC with examples – Classification of EMI/EMC – CE – RE – CS – RS – Units of parameters – Sources of EMI – EMI coupling modes – CM and DM – ESD phenomena and effects – Transient phenomena and suppression.

UNIT II EMI MEASUREMENTS 9

Basic principles of RE, CE, RS and CS measurements – EMI measuring instruments – Antennas – LISN – Feed through capacitor – Current probe – EMC analyzer and detection technique open area site – Shielded anechoic chamber – TEM cell.

UNIT III EMC STANDARD AND REGULATIONS 8

National and intentional standardizing organizations – FCC – CISPR – ANSI – DOD – IEC – CENEEC – FCC – CE and RE standards – CISPR – CE and RE standards – IEC/EN – CS standards – Frequency assignment – Spectrum conversion.

UNIT IV EMI CONTROL METHODS AND FIXES 10

Shielding – Grounding – Bonding – Filtering – EMI gasket – Isolation transformer – Opto-isolator.

UNIT V EMC DESIGN AND INTERCONNECTION TECHNIQUES 9

Cable routing and connection – Component selection and mounting – PCB design – Trace routing – Impedance control – Decoupling – Zoning and grounding

TOTAL: 45

TEXT BOOKS

1. Prasad Kodali V., “Engineering Electromagnetic Compatibility”, S. Chand and Co, 2000.

2. Clayton R. Paul, “Introduction to Electromagnetic Compatibility” , Wiley and sons ,1992

REFERENCES

1. Keiser, “Principles of Electromagnetic Compatibility”, 3rd Edition, Artech House , 1994

3. Donwhite Consultant Incorporate , “Handbook Of EMI / EMC” , Vol I , 1985

17152E74DP **SEMESTER VII**

SOLID STATE ELECTRONIC DRIVES 4 0 0 3

AIM

To have fundamental knowledge about structure of devices, VI characteristics of devices like PN Junction diode, Zener diode, MOSFET, BJT and Opto electronic.

OBJECTIVES:

- To learn crystal structures of elements used for fabrication of semiconductor devices.
- To study energy band structure of semiconductor devices.
- To understand fermi levels, movement of charge carriers, Diffusion current and Drift current.
- To study behavior of semiconductor junction under different biasing conditions. Fabrication of different semiconductor devices, Varactor diode, Zener diode, Schottky diode, BJT, MOSFET, etc.
- To study the VI Characteristics of devices and their limitations in factors like current, power frequency.
- To learn photoelectric effect and fabrication of opto electronic devices.

UNIT I: CRYYSTAL PROPERTIES AND GROWTH SEMICONDUCTORS 9

Semiconductor materials – periodic Structures – Crystal Lattices – Cubic lattices – Planes and Directions – Diamond lattice – Bulk Crystal Growth – Starting Material – Growth of Single Crystal Ingots – Wafers – Doping – Epitaxial Growth – Lattice Matching in Epitaxial Growth – Vapor – Phase Epitaxy – Atoms and Electronics – Introduction to Physical Models – Experimental Observations – Photoelectric Effect – Atomic spectra – Bhr model – Quantum Mechanics – Probability and Uncertainty Principle – Schrodinger Wave Equation – Potential Well Equation – Potential well Problem – Tunneling.

UNIT II: ENERGY BANDS AND CHARGE CARRIERS IN SEMICONDUCTORS AND JUNCTIONS 9

Energy bands in Solids, Energy Bands in Metals, Semiconductors, and Insulators – Direct and Indirect Semiconductors – Variation of Energy Bands with Alloy Composition - Charge Carriers in Semiconductors – Electrons and Holes – Electrons and holes in Quantum Wells – Carrier Concentrations –Femi Level – Electron and Hole Concentrations at Equilibrium – Temperature Dependence of Carrier Concentrations – Compensation and Space Charge Neutrality – Drift of Carrier in Electric and Magnetic Fields conductivity and Mobility – Drift and Resistance – Effects of Temperature and Doping on Mobility – High Field effects – Hall Effect – invariance of Fermi level at equilibrium – Fabrication of p-n junctions, Metal semiconductor junctions.

UNIT III: METAL OXIDE SEMICONDUCTOR FET 9

GaAS MESFET – High Electron Mobility Transistor – Short channel Effects – Metal Insulator Semiconductor FET – Basic Operation and Fabrication – Effects of Real Surfaces – Threshold Voltage – MOS capacitance Measurements – Current – Voltage Characteristics of MOS Gate Oxides – MOS Field Effect Transistor – Output Characteristics – Transfer characteristics - Short Channel MOSFET V-I characteristics – Control of Threshold Voltage – Substrate Bias Effects - Sub threshold characteristics – Equivalent Circuit for MOSFET –MOSFET Scaling and Hot Electron Effects – Drain – Induced Barrier Lowering – short channel and Narrow width Effect – Gate Induced Drain Leakage.

UNIT IV: OPTO ELECTRON DEVICES 9

Photodiodes – Current and Voltage in illuminated Junction – Solar Cells – Photo detectors – Noise and Bandwidth of Photo detectors – Light Emitting Diodes – Light Emitting Material – Fiber Optic Communication Multilayer Heterojunctions for LEDS – Lasers – Semiconductor lasers – Population Inversion at a Junction Emission Spectra for p-n junction – Basic Semiconductor laser – Materials for Semiconductor laser.

UNIT V HIGH FREQUENCY AND HIGH POWER DEVICES 9

Tunnel Diode, IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode – transferred – electron mechanism, formation and drift of space charge domains, p-n-p-n diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.

TOTAL: 45

TEXT BOOKS

1. Ben. G. Streetman & Sanjan Banerjee, Solid State Electronic Devices, 5th Edition, PHI, 2003.

REFERENCES

2. Donald A. Neaman, Semiconductor Physics and Devices, 3rd Edition, TMH, 2002.
3. Yannis Tsividis, Operation & Mode line of MOS Transistor, 2nd Edition, Oxford University Press, 1999.
3. Nandita Das Gupta & aamitava Das Gupta, Semiconductor Devices Modeling a Technology, PHI, 2004.
4. D.K. Bhattacharya & Rajinish Sharma, Solid State Electronic Devices, Oxford University Press, 2007.

17152E74EP **SEMESTER VII**

COMPUTER HARDWARE AND INTERFACING **4 0 0 3**

AIM

To enable the student to get a detailed knowledge of all the hardware components that make up a computer and to understand the different interfaces required for connecting these hardware devices.

OBJECTIVES

- To introduce issues related to CPU and memory.
- To understand the components on the motherboard
- To understand different storage media
- To introduce the features of different I/O peripheral devices and their interfaces.

UNIT I CPU AND MEMORY 9

CPU essentials – processor modes – modern CPU concepts – Architectural performance features – the Intel's CPU – CPU over clocking – over clocking requirements – over clocking the system – over clocking the Intel processors – Essential memory concepts – memory organizations – memory packages – modules –memory.

UNIT II MOTHERBOARDS 9

Pentium4 mother board -form factor – upgrading a mother board – chipsets – north bridge – south bridge –motherboard BIOS – POST – BIOS features – BIOS and Boot sequences – BIOS shortcomings and compatibility issues – power supplies and power management – concepts of switching regulation – potential power problems – power management.

UNIT III STORAGE DEVICES 9

The floppy drive – magnetic storage – magnetic recording principles – data and disk organization – floppy drive – hard drive – data organization and hard drive – sector layout –CDROM electronics – DVD-ROM – DVD media – DVD drive and decoder.

UNIT IV I/O PERIPHERALS 9

Parallel port – signals and timing diagram – IEEE1284 modes – asynchronous communication - serial port signals – video adapters – graphic accelerators – 3D graphics accelerator issues –

UNIT V BUS ARCHITECTURE 9

Buses – Industry standard architecture (ISA), peripheral component Interconnect (PCI) – Accelerated Graphics port (AGP) – plug-and-play devices – SCSI concepts – USB architecture.

TOTAL: 45

TEXT BOOK

1. Stephen J.Bigelow, "Trouble Shooting, maintaining and Repairing PCs", Tata McGraw-Hill, New Delhi, 2001.

REFERENCES

1. Craig Zacker & John Rourke, "The complete reference:PC hardware", Tata McGraw-Hill, New Delhi, 2001.
2. Mike Meyers, "Introduction to PC Hardware and Trouble shooting", Tata McGraw-Hill, New Delhi, 2003.
3. B.Govindarajulu, "IBM PC and Clones hardware trouble shooting and maintenance", Tata McGraw-Hill, New Delhi, 2002.

PRIST DEEMED UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

M.TECH – COMMUNICATION SYSTEMS
[FULL TIME]

[REGULATION 2017]

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To provide students with strong fundamental concepts and also advanced techniques and tools to build various communication systems.

PEO2: To enable graduates to attain successful professional careers by applying their engineering skills in communication system design to meet out the challenges in industries and academia.

PEO3: To engage graduates in lifelong learning, adapt emerging technology and pursue research for the development of innovative products.

PROGRAMME SPECIFIC OBJECTIVES (PSOs):

PSO1: To inculcate the ability in graduates to design and analyze the subsystems such as RF, Signal processing, Modern communication systems and networks.

PSO2: To enhance problem solving skills in communication systems design using the latest hardware and software tools.

PSO3: To apply communication engineering principles and practices for developing products for scientific and business applications.

PROGRAM OUTCOMES (POS):

M.Tech students will be able to:

PO1: **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **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.

PO3: **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.

PO4: **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.

PO5: **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.

PO6: **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.

PO7: **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.

PO8: **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **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.

PO11: **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.

PO12: 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 (PEOs) WITH PROGRAMME OUTCOMES (POs):

The mapping between the Programme Educational Objectives (PEOs) and the Programme Outcomes (POs) is given in the following table:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
PEO1	3	2	1	1	2	1	-	-	2	-	-	2
PEO2	3	3	2	3	3	2	1	1	2	2	1	1
PEO3	3	3	3	3	3	1	1	1	2	2	1	3

Contribution 1: Reasonable 2: Significant 3: Strong

MAPPING OF PROGRAM SPECIFIC OBJECTIVES (PSOs) WITH PROGRAMME OUTCOMES (POs):

A broad relation between the Programme Specific Objectives (PSOs) and the Programme Outcomes(POs) is given in the following table:

PROGRAMME SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
PSO1	3	2	1	1	1	1	1	-	1	-	-	1
PSO2	3	3	1	3	3	1	1	-	1	-	-	1
PSO3	3	3	2	3	2	3	2	2	2	2	2	2

Contribution 1: Reasonable 2: Significant 3: Strong

M.TECH .COMMUNICATION SYSTEMS -FULL TIME-R2017

SEMESTER I

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	17248S11B	Applied mathematics for Electronics Engineering	3	1	0	4
2	17271H12	Statistical Signal Processing	4	0	0	4

3	17271H13	Modern Digital Communication Systems	4	0	0	4
4	17271S14	Communication Protocol Engineering	4	0	0	4
5	17271H15	Advanced Radiation Systems	4	0	0	4
6	17271E16_	**Elective-I**	4	0	0	4
		Practical				
8	17271L17	Communication Systems Lab - I	0	0	3	3
		Research Skill Development (RSD) Course				
7	17271CRS	Research Led Seminar	1	0	0	1
		Total Credits		**28**		

SEMESTER II

S.N	SUB CODE	SUBJECT	L	T	P	C
		Theory				
1	17271H21	Mobile Communication Networks	4	0	0	4
2	17271H22	Advanced Microwave Systems	4	0	0	4
3	17271H23	Fiber Optic Networking	4	0	0	4
4	17271E24_	**Elective-II**	**4**	**0**	**0**	**4**
5	17271E25_	**Elective-III**	**4**	**0**	**0**	**4**
		Practical				
6	17271L26	Communication Systems Lab - II	0	0	3	3
7	172TECWR	Technical Writing /Seminars	0	0	3	3
		Research Skill Development (RSD) Course				
8	17271CRM	Research Methodology	**3**	**0**	**0**	**3**
9	17271CBR	Participation in Bounded Research	**2**	**0**	**0**	**2**
		Total Credits		**31**		

SEMESTER III

S.N	SUB CODE	SUBJECT	L	T	P	C
		Theory				
1	17271H31	Wireless Sensor Networks	4	0	0	4
2	17271E32-	**Elective – IV**	**4**	**0**	**0**	**4**
3	17271E33-	**Elective – V**	**4**	**0**	**0**	**4**
4	17271E34-	**Elective – VI**	**4**	**0**	**0**	**4**
		Research Skill Development (RSD) Course				
5	17271P35	Project Phase – I	0	0	6	6
6	17271CSR	Participation in Scaffolded Research(Design/Societal Project)	**4**	**0**	**0**	**4**
		Total Credits		**26**		

SEMESTER IV

S.N	SUB CODE	SUBJECT	L	T	P	C
1	17271P41	Project Phase – II	0	0	12	12
		Total Credits		**12**		

Elective-I (SEMESTER – I)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E16A	Internetworking and Multimedia	4	0	0	4
2.	17271E16B	Digital Image Processing	4	0	0	4
3.	17271E16C	LASER Communication	4	0	0	4
4	17271E16D	MEMS and NEMS	4	0	0	4

Elective-II (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E24A	High Speed Switching Architecture	4	0	0	4
2.	17271E24B	DSP Processor Architecture and Programming	4	0	0	4
3.	17271E24C	Digital Speech Processing	4	0	0	4
4	17271E24D	ASIC and FPGA Design	4	0	0	4

Elective-III (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E25A	Digital Communication Receivers	4	0	0	4
2.	17271E25B	Soft Computing	4	0	0	4
3.	17271E25C	Communication Network Security	4	0	0	4
4.	17271E25D	Radar Signal Processing	4	0	0	4

Elective-IV (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E32A	Software Defined Radio	4	0	0	4
2.	17271E32B	Satellite Communication	4	0	0	4
3.	17271E32C	CDMA Systems	4	0	0	4
4	17271E32D	Speech Processing and Synthesis	4	0	0	4

Elective-V (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E33A	Wavelets and MultiResolution Processing	4	0	0	4
2.	17271E33B	High performance Communication Networks	4	0	0	4
3.	17271E33C	Advanced Microprocessors and Microcontrollers	4	0	0	4
4	17271E33D	Reconfigurable Computing	4	0	0	4

Elective-VI (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E34A	Simulation of Communication Networks	4	0	0	4
2.	17271E34B	Medical Imaging	4	0	0	4
3.	17271E34C	Mobile ADHOC networks	4	0	0	4
4	17271E34D	Ultra Wide Band Communication	4	0	0	4

M.TECH (FULL TIME) –CS – R2017

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Semester	Foundation Course	Core Courses	Elective Courses	Others	Total

		Theory	Practical	Core Electives	Open Electives		
I	4	16	3	4	-	1	**28**
II	-	12	6	8	-	5	**31**
III	-	4	6	12	-	4	**26**
IV	-	-	12	-	-	-	**12**
						TOTAL CGPA CREDITS	**97**

HOD **DEAN**

17248S11B APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERING

L T P C
3 1 0 4

AIM:

The primary aim of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable in communication engineering.

OBJECTIVES:

The primary objective of this course will help the students to identify, formulate, abstract, and solve problems using mathematical tools from a variety of mathematical areas, including fuzzy logic, matrix linear programming, probability, numerical solution of ordinary differential equations and queuing models.

UNIT I CALCULUS OF VARIATIONS 9

Functional – Euler's equation-Variational problems involving one unknown function-several unknown functions-functional dependent on higher order derivatives-several independent variables-isoperimetric problems.

UNIT II INTEGRAL TRANSFORMS AND WAVE EQUATIONS 9

Fourier transform pairs, Properties – Fourier Sine and Cosine transforms, Convolution integrals, Evaluation of integrals using Fourier Transform.Discrete Fourier Transform - properties.Application of Fourier transform to wave equation.Z-transform-properties-inverse transform- solution to difference equation.

UNIT III LINEAR PROGRAMMING 9

Simplex algorithm-two phase method-duality-transportation and assignment problems-inventory-scheduling.

UNIT IV RANDOM PROCESS AND QUEUING THEORY 9

Classification – auto correlation-cross correlation-ergodicity-power spectral density function-Poisson process.Single and multiple server Markovian queuing models- customer impatience-queuing applications.

UNIT V TESTING OF HYPOTHESIS 9

Sampling distributions-Testing of hypothesis of normal, t, chi square, F distributions for testing mean and variance- large sample test. Analysis of variance – one way classification.

Tutorial :15 Total:60 Periods

OUTCOMES:

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

- Concepts on vector spaces, linear transformation, inner product spaces, eigenvalues and generalized eigenvectors.
- Apply various methods in linear algebra to solve systems of linear equations.
- Could develop a fundamental understanding of linear programming models, able to develop a linear programming model from problem description, apply the simplex method for solving linear programming problems.
- Numerical solution of differential equations by single and multistep methods.

- Computation of probability, random variables and their associated distributions, correlations and regression.
- Conceptualize the principle of optimality and sub-optimization, formulation and computational procedure of dynamic programming.
- Exposing the basic characteristic features of a queuing system and acquiring skills in analyzing queuing models.
- Using discrete time Markov chains to model computer systems.

BOOKS FOR REFERENCES :

1. Grewal.B.S. "Higher Engineering Mathematics", Khanna Publications, 2005.
2. Kapoor.J.N. & Saxena.H.C., Mathematical Statistics, S.Chand & Co., New Delhi.
3. Taha.H.A. "Operation Research – An Introduction", 6th Edition, PHI, 1997.
4. M.K. Venkataraman, "Higher Mathematics for Engineering & Science", National Publishing Company, 2000.
5. Kandasamy, "Engineering Mathematics Volume II, S.Chand & Co.
6. P.K. Guptha, D.S. Hira, Operations Research, S.Chand & Co., 1999
7. T.Veerarajan, Probability, Statistics and Random Processes, TMH, 2002

17271H12 STATISTICAL SIGNAL PROCESSING L T P C
4 0 0 4

AIM:

The student comprehends mathematical description and modelling of discrete time random signals.

OBJECTIVES:

- The student is conversant with important theorems and algorithms.
- The student learns relevant figures of merit such as power, energy, bias and consistency.
- The student is familiar with estimation, prediction and filtering concepts and techniques.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete Random Processes-, Autocorrelation and Autocovariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram -, Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION 9

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method.
Parametric Methods - AR, MA, and ARMA model based spectral estimation.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Linear prediction- Forward and backward predictions, - Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS 9

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters-Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation for sampling rate conversion- Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

Total:45 Periods

OUTCOMES:

- Formulate time domain and frequency domain description of Wide Sense Stationary process in terms of matrix algebra and relate to linear algebra concepts.
- State Parseval‟s theorem, W-K theorem, principle of orthogonality, spectral factorization theorem, Widrow-Hoff LMS algorithm and Shannon‟s sampling theorem, and define linear prediction, linear estimation, sample auto-correlation, periodogram, bias and consistency.
- Explain various noise types, Yule-Walker algorithm, parametric and non-parametric methods, Wiener and Kalman filtering, LMS and RMS algorithms, Levinson Durbin algorithm, adaptive noise cancellation and adaptive echo cancellation, speed verses convergence issues, channel equalization, sampling rate change, subband coding and wavelet transform.

- Calculate mean, variance, auto-correlation and PSD for WSS stochastic processes, and derive prediction error criterion, Wiener-Hoff equations, Parseval"stheorem,W-K theorem and normal equations.
- Design AR, MA, ARMA models, Wiener filter, anti aliasing and anti imaging filters, and develop FIR adaptive filter and polyphase filter structures.
- Simulate spectral estimation algorithms and basic models on computing platforms.

BOOKS FOR REFERENCES :

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.

17271H13 MODERN DIGITAL COMMUNICATION SYSTEMS L T P C
4 0 0 4

AIM:

To understand the basics of signal-space analysis and digital transmission.

OBJECTIVES:

- To understand the coherent and noncoherent receivers and its impact on different channel characteristics.
- To understand the different Equalizers
- To understand the different block coded and convolutional coded digital communication systems.
- To understand the basics of Multicarrier and Multiuser Communications.

UNIT I COHERENT AND NON-COHERENT COMMUNICATION: 9

Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent Receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially Coherent receives – DPSK; M-PSK; M-DPSK,-BER Performance Analysis.

UNIT II BANDLIMITED CHANNELS AND DIGITAL MODULATIONS: 9

Eye pattern; demodulation in the presence of ISI and AWGN; Equalization techniques – IQ modulations;QPSK; QAM; QBOM; -BER Performance Analysis. – Continuous phase modulation; CPFM; CPFSK;MSK,OFDM.

UNIT III BLOCK CODED DIGITAL COMMUNICATION: 9

Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal –Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes; Hammning; Golay;Cyclic; BCH ; Reed – Solomon codes.

UNIT IV CONVOLUTIONAL CODED DIGITAL COMMUNICATION: 9

Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

UNIT V SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION 9

Model of spread Spectrum Digital Communication System-Direct Sequence Spread Spectrum Signals, Error rate performance of the coder, Generation of PN Sequences- Frequency-Hopped Spread Spectrum Signals, Performance of FH Spread Spectrum Signals in an AWGN Channel-Synchronization of Spread Spectrum Systems.

Total:45 Periods

OUTCOMES:

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

- Develop the ability to understand the concepts of signal space analysis for coherent and non- coherent receivers.
- Conceptually appreciate different Equalization techniques
- Possess knowledge on different block codes and convolutional codes.
- Comprehend the generation of OFDM signals and the techniques of multiuser detection.

BOOKS FOR REFERENCES :

1. M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signalling and detection, Prentice HallIndia, New Delhi. 1995.
2. Simon Haykin, Digital communications, John Wiley and sons, 1998
3. Wayne Tomasi, Advanced electronic communication systems, 4th Edition Pearson EducationAsia, 1998
4. B.P.Lathi Modern digital and analog communication systems, 3rd Edition, Oxford Universitypress 1998.
5. John G. Proakis, Digital Communications, 4th Edition, McGraw-Hill, New york , 2001

17271S14 COMMUNICATION PROTOCOL ENGINEERING **L T P C**
4 0 0 4

AIM:

To expose the students to the layered architecture for communication networks and the specific functionality of the network layer.

OBJECTIVES:

- To enable the student to understand the basic principles of routing and the manner this is implemented in conventional networks and the evolving routing algorithms based on Internetworking requirements, optical backbone and the wireless access part of the network.
- To enable the student to understand the different routing algorithms existing and their performance characteristics.

UNIT I NETWORK REFERENCE MODEL 9

Communication model-software, subsystems, protocol, protocol development methods, Protocol engineering process, Layered architecture, Network services and Interfaces, Protocol functions, OSI model, TCP/IP protocol suite

UNIT II PROTOCOL SPECIFICATIONS 9

Components of protocol, Specifications of Communication service, Protocol entity, Interface, Interactions, Multimedia protocol, Internet protocol, SDL, SDL based protocol- other protocol specification languages

UNIT III PROTOCOL VERIFICATION/VALIDATION 9

Protocol verification, Verification of a protocol using finite state machines, Protocol validation, protocol design errors, Protocol validation approaches, SDL based protocol verification and validation

UNIT IV PROTOCOL CONFORMANCE/PERFORMANCE TESTING 9

Conformance testing methodology and framework, Conformance test architectures, Test sequence generation methods, Distributed architecture by local methods, Conformance testing with TTCN, systems with semi controllable interfaces - RIP,SDL based tools for conformance testing, SDL based conformance testing of MPLS Performance testing, SDL based performance testing of TCP and OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using Bridge, Scalability testing

UNIT V PROTOCOL SYNTHESIS AND IMPLEMENTATION 9

Protocol synthesis, Interactive synthesis algorithm, Automatic synthesis algorithm, Automatic synthesis of SDL from MSC, Protocol Re-synthesis; Requirements of protocol implementation, Object based approach to protocol implementation, Protocol compilers, Tool for protocol engineering

Total:45 Periods

OUTCOMES:

- Given the network and user requirements and the type of channel over which the network has to operate, the student would be in a position to apply his knowledge for identifying a suitable routing algorithm, implementing it and analyzing its performance.
- The student would also be able to design a new algorithm or modify an existing algorithm to satisfy the evolving demands in the network and by the user applications.

BOOKS FOR REFERENCES :

1. Pallapa Venkataram and Sunilkumar S.Manvi, “Communication protocol Engineering”, EasternEconomy edition, 2004
2. Richard Lai and Jirachiefpattana, “Communication Protocol Specification and Verification”, KluwerPublishers, Boston, 1998.
3. Tarnay, K., “Protocol Specification and Testing”, Plenum, New York, 1991.
4. Mohamed G. Gouda, “Elements of Network Protocol Design”, John Wiley & Sons, Inc. New York,USA, 1998
5. V.Ahuja, “Design and Analysis of Computer Communication networks”, McGraw-Hill, London,1982.
6. G.J.Holtzmann, “Design and validation of Computer protocols”, Prentice Hall, New York, 1991.

17271H15 ADVANCED RADIATION SYSTEMS **L T P C**
4 0 0 4

AIM:

To enhance the student's knowledge in the area of various antenna design.

OBJECTIVES:

- To understand antenna radiation and its parameters.
- To enhance the student's knowledge in the area of various antenna design.
- To design monopole, dipole and patch antenna and to impart the knowledge about modern antennas.

UNIT ICONCEPTS OF RADIATION 9

Retarded vector potentials – Heuristic approach and Maxwell's equation approach. Electric vector potential F for a magnetic current source M. Duality theorem. The Lorentz gauge condition. Vector potential in Phasor form. Fields radiated by an alternating current element and half wave dipole. Total power radiated and radiation resistance of alternating current element and half wave dipole. Power radiated in the far field. Linear, Elliptical and circular polarization. Development of the Poincare sphere.

UNIT II ANTENNA ARRAYS 9

N element linear arrays – uniform amplitude and spacing- Phased arrays- Directivity of Broadside and End fire arrays. Three dimensional characteristics - Pattern multiplication- Binomial arrays and Dolph-Tchebycheff arrays. Circular array. Mutual coupling in arrays, multidimensional arrays- phased arrays and array feeding techniques.

UNIT III ANTENNA SYNTHESIS 9

Synthesis problem-Line source based beam synthesis methods (Fourier transform and Woodward-Lawson sampling method – Linear array shaped beam synthesis method – Low side lobe, narrow main beam synthesis methods - discretization of continuous sources. Schelkunoff polynomial method

UNIT IV APERTURE ANTENNAS 9

Radiation from apertures - Huygens Principle. Rectangular apertures- techniques for evaluating gain,Circular apertures and their design considerations- Babinet's principle Fraunhofer and Fresnel diffraction.Complimentary screens and slot antennas. Slot and dipoles as dual antennas. Fourier transform in aperture antenna theory.

UNIT V HORN, MICROSTRIP, REFLECTOR ANTENNAS. 9

E and H plane sectoral Horns. Pyramidal horns. Conical and corrugated Horns. Multimode horns. Phase center.Microstrip antennas – feeding methods. Rectangular patch- Transmission line model – Circular patch Parabolic Reflector antennas – Prime focus and cassegrain reflectors. Equivalent focal length of Cassegrain antennas. Spillover and taper efficiencies. Optimum illumination.

Total:45 Periods

OUTCOMES:

- Ability to understand antenna concepts
- Ability to design antenna for various applications
- Knowledge of modern antenna design

BOOKS FOR REFERENCES :

1. Balanis, C.A., “Antenna Theory” Wiley,2003
2. Warren L. Stutzman and Gary A. Thiele,“ Antenna theory and design”John Wiley and sons 1998
3. Jordan, E.C., “ Electromagnetic waves and Radiating systems”. PHI 2003
4. Krauss, J.D., “ Radio Astronomy” McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D.,, Fleisch,D.A., “Electromagnetics” McGraw-Hill,1999

17271L17 COMMUNICATION SYSTEM LABORATORY - I **L T P C**
0 0 3 3

OBJECTIVES:

- To acquire knowledge on Transmission line and S- parameter estimation of microwave devices.
- To introduce the basics of Microstrip Patch Antenna and its analysis .
- To study & measure the performance of digital communication systems.
- To provide a comprehensive knowledge of Wireless Communication.
- To learn about the design of digital filters and its adaptive filtering algorithms.

LIST OF EXPERIMENTS:

1. Antenna Radiation Pattern measurement.
2. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
3. Implementation of Adaptive Filters, period gram and multistage multirate system in DSP Processor
4. Performance evaluation of Digital Data Transmission through Fiber Optic Link.
5. Study of Spread Spectrum Techniques.
6. Simulation of QMF using Simulation Packages.
7. Implementation of Video Link using Optical Fiber.
8. Implementation of Linear and Cyclic Codes.

TOTAL :45 PERIODS

OUTCOMES:

Upon the completion of course, students are able to

- Measure and analyze various transmission line parameters.
- Design Microstrip patch antennas.
- Implement the adaptive filtering algorithms
- To generate and detect digital communication signals of various modulation techniques using MATLAB.

17271E16A INTERNETWORKING AND MULTIMEDIA L T P C
4 0 0 4

AIM:

The aim of this module is to address the technical issues and the solutions for the implementation of multimedia services on the Internet.

OBJECTIVES:

- Recent advances in multimedia and networking technologies have made possible the evolution of the Internet from a text-based environment to a multimedia global communication network.
- The objective of this module is to address the technical issues and the solutions for the implementation of multimedia services on the Internet.
- After studying this module, students are expected to be able to appreciate the state-of-the-art in Internet technologies for multimedia services.

UNIT I MULTIMEDIA NETWORKING 9

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/ video transform, multimedia coding and compression for text, image, audio and video.

UNIT II BROADBAND NETWORK TECHNOLOGY 9

Broadband services, ATM and IP, IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling, and policing, throughput, delay and jitter performance. Storage and media services, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS 9

Multicast over shared media network, multicast routing and addressing, scaling multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP. MIME, Peer- to-Peer computing, shared application, video conferencing, centralized and distributed conference control,distributed virtual reality, lightweight session philosophy.

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture, - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG_4 video Transport across internet.

UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS 9

Packet Audio/video in the network environment, video transport across Generic networks-Layered video coding, error Resilient video coding techniques, Scalable Rate control, Streaming video across Internet,Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

Total:45 Periods

OUTCOMES:

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

- Understand the state-of-art developments in Internet technologies and applications
- Understand the development of next generation Internet
- Appreciate the principles used in designing Internet protocols for multimedia applications, and so understand why standard protocols are designed the way that they are
- Be able to solve problems for the design of multimedia applications on the Internet.

BOOKS FOR REFERENCES :

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd.Singapore, 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, New York. 1995.
3. Tay Vaughan, Multimedia - Making it to work, 4ed, Tata McGraw Hill , NewDelhi, 2000.
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, PHI ,

SEMESTER I
ELECTIVE - I

17271E16B DIGITAL IMAGE PROCESSING L T P C
4 0 0 4

AIM:

The aim of this course is to explain the fundamentals of digital image processing.

OBJECTIVES:

- To understand the image fundamentals.
- To understand the various image segmentation techniques.
- To extract features for image analysis.
- To introduce the concepts of image registration and image fusion.

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

Elements of digital image processing systems - Elements of visual perception - Psycho visual model- Brightness - Contrast - Hue - Saturation - Mach band effect - Color image fundamentals – RGBHSI models - Image sampling - Quantization - Dither - Two-dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS 9

1D DFT - 2D transforms - DFT - DCT - Discrete Sine - Walsh - Hadamard - Slant - Haar - KLT SVD - Wavelet Transform.

UNIT III ENHANCEMENT AND RESTORATION 9

Histogram modification and specification techniques - Noise distributions - Spatial averaging - Directional Smoothing – Median - Geometric mean - Harmonic mean – Contra harmonic and Yp mean filters - Homomorphic filtering - Color image enhancement - Image Restoration – Degradation model - Unconstrained and Constrained restoration - Inverse filtering - Removal of blur caused by uniform linear motion - Wiener filtering - Geometric transformations - Spatial transformations -Gray Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

Edge detection - Image segmentation by region growing - Region splitting and merging – Edge linking - Image Recognition - Patterns and pattern classes - Matching by minimum distance classifier - Matching by correlation - Back Propagation Neural Network - Neural Network applications in Image Processing.

UNIT V IMAGE COMPRESSION 9

Need for data compression - Huffman - Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Block Truncation Coding - Transform Coding - DCT and Wavelet - JPEG -MPEG – Standards - Concepts of Context based Compression.

Total:45 Periods

OUTCOMES:

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

- Explain the fundamentals of digital image processing.
- Describe image various segmentation and feature extraction techniques for image analysis.
- Discuss the concepts of image registration and fusion.

BOOKS FOR REFERENCES :

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Second Edition, Pearson Education Inc., 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.
3. David Salomon , "Data Compression The Complete Reference", 2nd Edition, Springer Verlag , New York Inc., 2001.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing using MATLAB", Pearson Education, Inc., 2004.
5. William K. Pratt, "Digital Image Processing", John Wiley, NewYork, 2002.
6. Milman Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and MachineVision", 2nd edition, Brooks/Cole, Vikas Publishing House, 1999.

SEMESTER I

ELECTIVE – I

17271E16C LASER COMMUNICATION L T P C
4 0 0 4

AIM:

The aim of this course is to gain knowledge about light and its propagation

OBJECTIVES:

- To study the nonlinear optic devices.
- To learn about holography.
- To study the different types of laser and its effects.

UNIT I INTRODUCTION TO LASER COMMUNICATIONS 9

Atmospheric low loss windows, optical sources and detectors for these windows, Characteristics of source and detectors. Optical transmitting and receiving antennas.

UNIT II SYSTEM DESIGN 9

Link equation, Transmitter terminal, Antenna design, Antenna gain, Beam width, C/N, Optical detectors, Optical modulation formats, Deriving error statistics, Signal requirements for acquisition and tracking, Fundamentals of system design.

UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9

Performance and Geometries, output wavelength control, Semiconductor laser lifetime, Direct and indirect modulation techniques and radiation effects.

UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9

Direct detection, coherent detection and demodulation. Gimbals in transceiver design, Receiver options and optics; Lasers; antennas / Telescope, Internal optical systems, Transmitter analysis.

UNIT V LASER BEAM POINTING CONTROL 9

Acquisition and Tracking systems, System description, Acquisition methodology, racking and pointing control system, RF cross link system design, link equation.

TOTAL:45 PERIODS

OUTCOMES:

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

- Understand the fundamentals of light and its propagation.
- Design nonlinear optic devices.
- Gain knowledge about holography and laser and its effects.

BOOKS FOR REFERENCES :

1. Morris Katzman, “Laser Satellite Communications”, Prentice Hall Inc, New York, 1991.
2. J. Franz and V.K.Jain, “Optical Communication Systems”, Narosa Publication, New Delhi, 1994.

SEMESTER I
ELECTIVE – I

17271E16D MEMS AND NEMS L T P C
4 0 0 4

AIM:

The aim of this course is to explain the basics of micro/nano electromechanical systems including their applications and advantages .

OBJECTIVES:

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

UNIT I OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nanoscale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Microelectromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation.Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials

UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezoresistive Pressure sensors- engineering mechanics behind these Micro sensors. Case study: Piezo-resistive pressure sensor

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 (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators

UNIT V NANOSYSTEMS AND QUANTUM MECHANICS 9

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Schrodinger Equation and Wave function Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the 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.

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

SEMESTER II

17271H21 MOBILE COMMUNICATION NETWORKS **L T P C**
4 0 0 4

AIM:

The aim of this course is to provide the basic cellular system concepts.

OBJECTIVES:

- To understand the basic cellular system concepts.
- To have an insight into the various propagation models and the speech coders used in mobile communication.
- To understand the multiple access techniques and interference education techniques in mobile communication

UNIT I OPERATION OF MOBILE COMMUNICATION NETWORKS 9

Operation of first, second, and third generation wireless networks: cellular systems, medium access techniques, Mobile networks Elementary Principles of cellular Telephony Channel Division Techniques(TDMA, FDMA, CDMA) Cellular Coverage Methods Network Planning and Resource Allocation,Network Dimensioning ,Mobility Management Procedures

UNIT II PROPAGATION MODELS AND AIR PROTOCOLS 9

Radio propagation models, error control techniques, handoff, power control, Soft handover, Forward link,Reverse link , common air protocols (AMPS, IS-95, IS-176, GSM, GPRS, EDGE, WCDMA, cdma2000,etc)

UNIT III MOBILE NETWORK ARCHITECTURE 9

General Architecture definition, Mobile Terminals (MT, SIM) Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC) User and Control Plane Protocol Stack, MAP & SS#7, the Key Role of Signaling Interfaces and Network Entities Relation The Physical Channel, The Logical Channels Terminal, Call and Network Management Procedures, Network Planning.

UNIT IV WIRELESS LOCAL AREA NETWORKS 9

Wireless Local Area Networks , General Characteristics of the Hiperlan System, 802.11 Standard, Basic DCF access scheme DCF Access Scheme with Handshaking, PCF Access Scheme, The 802.11a Standard, Mobile Ad Hoc Networks, Wireless Sensor Networks, Routing Energy Efficiency, Localization, Clustering.

UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 9

Security in Wireless Networks, Secure routing, Key Pre-distribution and Management, Encryption and Authentication, Security in Group Communication, Trust Establishment and Management, Denial of Service Attacks, Energy-aware security mechanisms, Location verification, Security on Data fusion.

Total:45 Periods

OUTCOMES:

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

- Discuss cellular radio concepts.
- Identify various propagation effects.
- To have knowledge of the mobile system specifications.
- Classify multiple access techniques in mobile communication.
- Outline cellular mobile communication standards.
- Analyze various methodologies to improve the cellular capacity

BOOKS FOR REFERENCES :

1. W. Stallings, "Wireless Communications and Networks",Second Edition Prentice Hall, 2007.
2. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
3. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall,2002.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and KeyArchitectures", McGraw-Hill, 2000.
5. J.Schiller,"Mobile Communications", Addison Wesley, 2000.

6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards",Addison Wesley, 2001.
7. Uyless Black ,"Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

17271H22 ADVANCED MICROWAVE SYSTEMS **L T P C**
4 0 0 4

AIM:

The aim of this course is to explain fundamentals of microwave integrated circuits.

OBJECTIVES:

- To understand the fundamentals of Microwave integrated circuits.
- To understand the various components for Wireless Communications.
- To know the basic techniques needed for analysis of Microwave systems.

UNIT I TECHNOLOGY OF HYBRID MICS 9

Dielectric substrates - thick film technology and materials - thin film technology and materials – methods of testing – encapsulation of devices for MICs – mounting of active devices.

UNIT II TECHNOLOGY OF MONOLITHIC MICS 9

Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer –diffusion-ion implantation – electron beam technology.

UNIT III ANALYSIS OF MICROSTRIP LINE 9

Methods of conformal transformation – numerical method for analysis – hybrid mode analysis – coupled mode analysis- method of images – losses in miscrostrips.

UNIT IV COUPLED MICROSTRIPS, SLOT LINE AND COPLANAR VEGUIDES 9

Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch line couplers– periodic branch line couplers – synchronous branch line couplers.

UNIT V LUMPED ELEMENTS AND NON-RECIPROCAL COMPONENTS 9

Design and fabrication using microstrips – flat resistors – flat inductors – interdigital capacitors – sandwich capacitors – ferromagnetic substrates for non-reciprocal devices – microstrip circulators – latching circulators – isolators – phase shifters.

Total:45 Periods

OUTCOMES:

- Capability to design Microwave circuits.
- To be able to analyze microwave integrated circuits.

REFERENCES:

1. Gupta,K.C, and Amarjit singh “Microwave Integrated Circuits” John Wiley and sons Wiley Eastern Reprint, 1978.
2. Hoffmann, R.K “Handbook of Microwave Integrated Circuits” Artech House, 1987.

17271H23 FIBER OPTIC NETWORKING L T P C
4 0 0 4

AIM:

The aim of the course is to design and analyze network components.

OBJECTIVES:

The students should be made to understand:

- Optical system components like optical amplifiers, wavelength converters.
- Up-to-date survey of development in Optical Network Architectures.
- Packet switching.
- Network design perspectives.
- Different Optical Network management techniques and functions.

UNIT I OPTICAL NETWORKING COMPONENTS: 9

First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers,filters, amplifiers, switches, and wavelength converters.

UNIT II SONET AND SDH NETWORKS: 9

Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network Elements, Topologies, Protection architectures, Ring architectures, Network Management.

UNIT III BROADCAST – AND- SELECT NETWORKS: 9

Topologies, Single-hop, Multi hop, and Shuffle net multi hop networks, Media-Access control protocols,Test beds.

UNIT IV WAVELENGTH-ROUTING NETWORKS: 9

Node designs, Issues in Network design and operation, Optical layer cost Tradeoffs, Routing and Wavelength assignment, Wavelength routing testbeds.

UNIT V HIGH CAPACITY NETWORKS: 9

SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test beds.

Total:45 Periods

OUTCOMES:

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

- Design and Analyze Network Components
- Assess and Evaluate optical networks

BOOKS FOR REFERENCES :

1. Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective, MorganKaufmann, 2nd edition, 2001.
2. Vivek Alwayn, Optical Network Design and Implementation, Pearson Education, 2004.
3. Hussein T.Mouftab and Pin-Han Ho, Optical Networks: Architecture and Survivability, KluwerAcademic Publishers, 2002.
4. Biswanath Mukherjee, Optical Communication Networks, McGraw Hill, 1997

ELECTIVE - II

17271E24A HIGH SPEED SWITCHING ARCHITECTURE

L	T	P	C
4	0	0	4

AIM:

To expose the student to the advances in packet switching architectures and IP addressing and switching solutions and approaches to exploit and integrate the best features of different architectures for high speed switching.

OBJECTIVES:

- To enable the student to understand the basics of switching technologies and their implementation LANs, ATM networks and IP networks.
- To enable the student to understand the different switching architectures and queuing strategies and their impact on the blocking performances.

UNIT I HIGH SPEED NETWORK 9

LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN -SDH multiplexing structure - ATM standard; ATM adaptation layers.

UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

UNIT III ATM SWITCHING ARCHITECTURE 9

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting - rearrangeable networks - full and partial connection networks - nonblocking networks –recursive network – construction and comparison of non-blocking network - switches with deflection routing – shuffle switch - tandem banyan.

UNIT IV QUEUES IN ATM SWITCHES 9

Internal queuing – Input, output and shared queuing - multiple queuing networks –combined input,output and shared queuing – performance analysis of queued switches.

UNIT V IP SWITCHING 9

Addressing mode - IP switching types-flow driven and topology driven solutions - IP Over ATM address and next hop resolution – multicasting - IPv6 over ATM.

Total:45 Periods

OUTCOMES:

- The student would be able to identify suitable switch architectures for a specified networking scenario and demonstrate its blocking performance.
- The student would be in a position to apply his knowledge of switching technologies, architectures and buffering strategies for designing high speed communication networks and analyse their performance

BOOKS FOR REFERENCES :

1. Achille Patavina, Switching Theory: Architectures and performance in Broadband ATM Networks.John Wiley & Sons Ltd., New York.1998.
2. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York.1998.
3. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications,3rd Edition, Adisson Wesley, New York,1999.

4. John A.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, NewYork, 1998.

SEMESTER II

ELECTIVE - II

17271E24B DSP PROCESSOR ARCHITECTURE AND PROGRAMMING

L T P C
4 0 0 4

AIM:

The aim of this course is to provide in-depth knowledge on digital signal processor basics.

OBJECTIVES:

The objective of this course is to provide in-depth knowledge on

- Digital Signal Processor basics
- Third generation DSP Architecture and programming skills
- Advanced DSP architectures and some applications.

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture-Pipelining –Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C3X PROCESSOR 9

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets -Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals –Generating and finding the sum of series, Convolution of two sequences, Filter design

UNIT III ADSP PROCESSORS I 9

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT IV ADVANCED PROCESSORS 9

Architecture of TMS320C54X: Pipeline operation, Addressing modes and assembly language instructions Introduction to Code Composer studio

UNIT V ADVANCED PROCESSORS II 9

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

Total:45 Periods

OUTCOMES:

Students should be able to:

- Become Digital Signal Processor specialized engineer
- DSP based System Developer

BOOKS FOR REFERENCES :

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming andApplications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. User guides Texas Instrumentation, Analog Devices, Motorola.

SEMESTER II

ELECTIVE - II

17271E24C DIGITAL SPEECH PROCESSING

L T P C
4 0 0 4

AIM:

To illustrate the concepts of speech signal representations and coding.

OBJECTIVES:

- To introduce speech production and related parameters of speech.
- To understand different speech modeling procedures such as Markov and their implementation issues.
- To gain knowledge about text analysis and speech synthesis.

UNIT I MECHANICS OF SPEECH 9

Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features.Music production – Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system – Psycho acoustics

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder. Homomorphic speech analysis: Cepstral analysis of Speech – Formant and Pitch Estimation –

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method– Solution of LPC equations — Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods — Formant analysis – VELP – CELP.

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9

Algorithms: Spectral Estimation, dynamic time warping, hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR — ASR systems– Voice response system – Speech Synthesis: Text to speech, voice over IP.

Total:45 Periods

OUTCOMES:

Students will be able to:

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.
- Choose an appropriate statistical speech model for a given application.
- Design a speech recognition system.
- Use different text analysis and speech synthesis techniques.

BOOKS FOR REFERENCES :

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall - 1978
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 1972

5. I.H.Witten – Principles of Computer Speech – Academic Press – 1982

SEMESTER -II

ELECTIVE – II

17271E24D ASIC AND FPGA DESIGN L T P C
4 0 0 4

AIM:

The aim of the course is to understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.

OBJECTIVES:

- To study the design flow of different types of ASIC.
- To familiarize the different types of programming technologies and logic devices.
- To learn the architecture of different types of FPGA.
- To gain knowledge about partitioning, floor planning, placement and routing including circuit extraction of ASIC
- To analyse the synthesis, Simulation and testing of systems.
- To understand the design issues of SOC.
- To know about different high performance algorithms and its applications in ASICs.

UNIT I OVERVIEW OF ASIC AND PLD **9**

Types of ASICs - Design flow – CAD tools used in ASIC Design – Programming Technologies: Antifuse – static RAM – EPROM and EEPROM technology, Programmable Logic Devices : ROMs and EPROMs – PLA –PAL. Gate Arrays – CPLDs and FPGAs

UNIT II ASIC PHYSICAL DESIGN **9**

System partition -partitioning - partitioning methods – interconnect delay models and measurement of delay - floorplanning - placement – Routing : global routing - detailed routing - special routing - circuit extraction - DRC

UNIT III LOGIC SYNTHESIS, SIMULATION AND TESTING **9**

Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation. Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

UNIT IV FPGA **9**

Field Programmable gate arrays- Logic blocks, routing architecture, Design flow technology - mapping for FPGAs, Xilinx XC4000 - ALTERA's FLEX 8000/10000, ACTEL's ACT-1,2,3 and their speed performance

Case studies: Altera MAX 5000 and 7000 - Altera MAX 9000 – Spartan II and Virtex II FPGAs - Apex and Cyclone FPGAs

UNIT V SOC DESIGN **9**

Design Methodologies – Processes and Flows - Embedded software development for SOC – Techniques for SOC Testing – Configurable SOC – Hardware / Software codesign Case studies: Digital camera, Bluetooth radio / modem, SDRAM and USB

TOTAL: 45 PERIODS

OUTCOMES:

- Demonstrate VLSI tool-flow and appreciate FPGA architecture.
- Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.
- Understand the algorithms used for ASIC construction
- Understand the basics of System on Chip, On chip communication architectures like AMBA,AXI and utilizing Platform based design.
- Appreciate high performance algorithms available for ASICs

REFERENCES:

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997
2. S. Trimberger, Field Programmable Gate Array Technology, Edr, Kluwer Academic Publications, 1994.
3. John V.Oldfield, Richard C Dore, Field Programmable Gate Arrays, Wiley Publications 1995.
4. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall,

1994.
5. Parag.K.Lala, Digital System Design using Programmable Logic Devices , BSP, 2003.
6. S. Brown, R. Francis, J. Rose, Z. Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
7. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995.
8. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.
9. Wayne Wolf, FPGA-Based System Design, Prentice Hall PTR, 2004.
10. R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.
11. F. Nekoogar. Timing Verification of Application-Specific Integrated Circuits (ASICs). Prentice Hall PTR, 1999.

ELECTIVE - III

SEMESTER II

17271E25A DIGITAL COMMUNICATION RECEIVERS **L T P C**
4 0 0 4

AIM:

The aim of this course is to understand the basic principles of digital communication techniques.

OBJECTIVES:

- To understand the basic principles of digital communication techniques.
- To gain knowledge about receivers for AWGN channel and Fading channels.
- To understand the concepts of synchronization and adaptive equalization techniques.

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Baseband and bandpass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading,diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

Total:45 Periods

OUTCOMES:

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

- Apply basic principles of digital communication techniques.
- Discuss on receivers for AWGN & Fading channel
- Describe various synchronization techniques.
- Design adaptive equalization algorithms to satisfy the evolving demands in digital communication.

BOOKS FOR REFERENCES :

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, “Digital Communication Receivers”, Vol I& II, John Wiley, New York, 1997
2. John. G. Proakis, “Digital Communication”, 4th ed., McGraw Hill, New York, 2001
3. E.A. Lee and D.G. Messerschmitt, “Digital Communication”, 2nd edition, Allied Publishers, NewDelhi, 1994
4. Simon Marvin, “Digital Communication Over Fading channel; An unified approach to performanceAnalysis”, John Wiley, New York, 2000
5. Bernard Sklar, “Digital Communication Fundamentals and Applications, Prentice Hall, 1998

SEMESTER II
ELECTIVE - III

17271E25B SOFT COMPUTING **L T P C**
4 0 0 4

AIM:

The aim of this course is to know the basics of artificial neural networks.

OBJECTIVES:

- To provide adequate knowledge about feed forward /feedback neural networks
- To apply the concept of fuzzy logic in various systems.
- To have the idea about genetic algorithms.
- To provide adequate knowledge about the applications of Soft Computing.

UNIT I ARTIFICIAL NEURAL NETWORKS 9

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rules-Supervised learning-Back propagation networks-Training algorithm, Practical difficulties, Advanced algorithms-Adaptive network- Radial basis network-modular network-Applications

UNIT II UNSUPERVISED NETWORKS 9

Introduction- unsupervised learning -Competitive learning networks-Kohonen self organising networks-Learning vector quantisation - Hebbian learning - Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Traveling Salesperson problem - Adaptive resonance theory –Bidirectional Associative Memory-Principle component Analysis

UNIT III FUZZY SYSTEMS 9

Fuzzy sets-Fuzzy rules: Extension principle, Fuzzy relation- fuzzy reasoning – fuzzy inference systems:Mamdani model, Sugeno model. Tsukamoto model -Fuzzy decision making- Multi objective Decision Making,-Fuzzy classification-Fuzzy control methods -Application

UNIT IV NEURO-FUZZY MODELLING 9

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress, Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real –Time Recurrent Learning.

UNIT V GENETIC ALGORITHM 9

Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittest crossover-Inversion and Deletion-mutation-reproduction-Generational cycle-rank method-rank space method- Other derivative free optimization-simulated annealing, Random search, Downhill simplex search-Application

Total:45 Periods

OUTCOMES:

- Knowledge on concepts of soft computational techniques.
- Able to apply soft computational techniques to solve various problems.
- Motivate to solve research oriented problems.

BOOKS FOR REFERENCES :

1. Jang J.S.R.,Sun C.T and Mizutani E – "Neuro Fuzzy and Soft computing", Pearson education(Singapore) 2004
2. David E.Goldberg : "Genetic Algorithms in Search, Optimization, and Machine Learning", PearsonEducation, Asia,1996
3. Laurene Fauseett:"Fundamentals of Neural Networks", Prentice Hall India, New Delhi,1994.
4. Timothy J.Ross:"Fuzzy Logic Engineering Applications", McGrawHill, New York,1997.

5. S.Rajasekaran and G.A.Vijayalakshmi Pai “Neural networks,Fuzzy logics,and Genetic algorithms”,Prentice Hall of India,2003
6. George J.Klir and Bo Yuan,”Fuzzy Sets and Fuzzy Logic”,Prentice Hall Inc., New Jersey,1995

17271E25C COMMUNICATION NETWORK SECURITY **L T P C**
4 0 0 4

AIM:

The aim of this course is to understand the need and concept of security.

OBJECTIVES :

The students should be made to:

- Understand the need and concept of security
- Learn cryptosystems

UNIT I SYMMETRIC CIPHERS 9

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security;Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES,Differential and Linear CryptAnalysis, Block Cipher Design Principles, Block Cipher Modes of operation, Stegnography.

UNIT II ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS 9

Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5-Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution.

UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS 9

Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems-,Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, -MD5 Message Digest Algorithm;Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital Signature Standards.

UNIT IV NETWORK SECURITY PRACTICE 9

Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT V SYSTEM SECURITY 9

Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats,Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

Total:45 Periods

OUTCOMES:

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

- Explain digital signature standards
- Discuss authentication
- Explain security at different layers

BOOKS FOR REFERENCES:

1. William Stallings, “Cryptography and Network Security”, 3rd Edition. Prentice Hall of India, New Delhi,2004
2. William Stallings, “Network Security Essentials”, 2nd Edition. Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman , “Network Security: Private Communication in Public World”, 2nd Edition. PrenticeHall of India, New Delhi ,2004

SEMESTER II

ELECTIVE –III

17271E25D RADAR SIGNAL PROCESSING L T P C

4 0 0 4

AIM:

The aim of this course is to understand the Radar Signal acquisition and sampling in multiple domains.

OBJECTIVES:

- To understand the Radar Signal acquisition and sampling in multiple domains
- To provide clear instruction in radar DSP basics
- To equip the skills needed in both design and analysis of common radar algorithms
- To understand the basics of synthetic aperture imaging and adaptive array processing
- To illustrate how theoretical results are derived and applied in practice

UNIT I INTRODUCTION TO RADAR SYSTEMS 9

History and application of radar, basic radar function, elements of pulsed radar, review of signal processing concepts and operations, A preview of basic radar signal processing, radar system components, advanced radar signal processing

UNIT II SIGNAL MODELS 9

Components of a radar signal, amplitude models, types of clutters, noise model and signal-to-noise ratio, jamming, frequency models: the doppler shift, spatial models, spectral model

UNIT III SAMPLING AND QUANTIZATION OF PULSED RADAR SIGNALS

Domains and criteria for sampling radar signals, Sampling in the fast time dimension,Sampling in slow time: selecting the pulse repetition interval, sampling the doppler spectrum,Sampling in the spatial and angle dimension, Quantization, I/Q Imbalance and Digital I/Q

UNIT IV RADAR WAVEFORMS 9

Introduction, The waveform matched filter, Matched filtering of moving targets, The ambiguity function, The pulse burst waveform, frequency-modulated pulse compression waveforms, Range sidelobe control for FM waveforms, the stepped frequency waveform, Phase-modulated pulse compression waveforms, COSTAS Frequency Codes.

UNIT V DOPPLER PROCESSING 9

Alternate forms of the Doppler spectrum, Moving target indication (MTI), Pulse Doppler processing, dwell-to-dwell stagger, Pulse pair processing, additional Doppler processing issues, clutter mapping and the moving target detector, MTI for moving platforms: adaptive displaced phase center antenna processing

TOTAL : 45 PERIODS

OUTCOMES:

- Know how a radar is built and understand the principles of behavior.
- Have a basic understanding of how radar signals propagate through a medium, and the mechanisms for signal reflection from the target and unwanted reflections ("clutter").
- Understand the basic principles of signal processing done in a radar.
- Be able to estimate the performance of a radar based on parameters provided, for example at what distance the radar will be able to detect targets of a given size.

- Be able to assess what type of radar is suitable for which task (choice of waveforms, frequency bands, etc..).
- Be able to use numerical tools to calculate radar performance and to simulate the signal processing in a radar.

REFERENCES:

1. Fundamentals of Radar Signal Processing, Mark A. Richards McGraw-Hill, New York, 2005
2. Principles of Radar and Sonar Signal Processing, Francois Le Chevalier, Artech House
3. Radar systems, Peak Detection and Tracking, Michael O Kolawole ,2010,Elsevier
4. Introduction To Radar Systems 3/E, Skolnik, McGraw Hill.
5. Radar Principles, Peyton Z. Peebles, 2009 Wiley India

6.Radar Design Principles-Signal Processing and the environment, Fred E. Nathanson, PHI

17271L26 COMMUNICATION SYSTEMS LAB -II **L T P C**
0 0 3 3

OBJECTIVES:

- To enable the students to verify the basic principles and design aspects involved in high frequency communication systems components
- To expose the student to different high frequency components and conduct the experiments to analyze and interpret data to produce meaningful conclusions and match with theoretical concepts.
- To design and develop RF components using microstrip technology

LIST OF EXPERIMENTS:

1. Simulation of Audio and speech compression algorithms
2. Simulation of EZW / SPIHT Image coding algorithm.
3. Simulation of Microstrip Antennas
4. S-parameter estimation of Microwave devices.
5. Study of Global Positioning System.
6. Performance evaluation of simulated CDMA System.
7. Design and testing of a Microstrip coupler.
8. Characteristics of $\lambda/4$ and $\lambda/2$ transmission lines.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply knowledge to identify a suitable architecture and systematically design an RF system.
- Comprehensively record and report the measured data, and would be capable of analyzing, interpreting the experimentally measured data and producing meaningful conclusions.
- Design and develop microstrip filters.

17271CRM **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, ScienceDirect etc., compiling literature, software utilization in literature collection- Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis.

UNIT III

Data Analysis using Excel- Tabulation of Data in excel (Creating Master Table and Sub Table), Formulas and Functions, Filters and Sort and Validation Lists, Data from External Sources. Data Analysis Using Charts and Graphs(Pivot Table & Charts), Time Value of Money, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, regression lines. Z-test, t- test F-test, ANOVA one way classification, Chi square test, independence of attributes. Time series: forecasting Method of least squares, Moving average method, Introduction to presentation tool, features and functions, Creating Presentation, Customizing presentation.

UNIT IV

Various research methods-Design of Experiments, Response Surface Methodology, Taguchi Methods- Modeling & Simulation of Engineering Systems, Artificial Neural Networks, Fuzzy Logic, MATLAB - Graph Theory- Finite Element Methods, Computational Fluid Dynamics -R programming in Statistics- open source software

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references

OUTCOMES:

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

- Understand the approaches towards and constraints in good research.
- Identify various statistical tools used in research methodology
- Train in basic computational and excel- skills for research in engineering.

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.
2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.
4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.
6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

SEMESTER III

17271H31 WIRELESS SENSOR NETWORKS **L T P C**
4 0 0 4

AIM:

The aim of this course is to study about wireless IP architecture, Packet Data Protocol and LTE network architecture.

OBJECTIVES:

- To study about advanced wireless networks, LTE, 4G and Evolutions from LTE to LTE.
- To study about adaptive link layer, hybrid ARQ and graph routing protocol.
- To study about mobility management, cellular network, and micro cellular networks

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 8
Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II ARCHITECTURES 9
Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING SENSORS 10
Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wake Up Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management,Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9
Topology Control, Clustering, Time Synchronization, Localization and Positioning,Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9
Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TOTAL: 45 PERIODS

OUTCOMES:

- Familiar with the latest 4G networks and LTE
- Understand about the wireless IP architecture and LTE network architecture.
- Familiar with the adaptive link layer and network layer graphs and protocol.
- Understand about the mobility management and cellular network.
- Understand about the wireless sensor network architecture and its concept.

BOOKS FOR REFERENCES:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

SEMESTER III

17271E32A SOFTWARE DEFINED RADIO

L	T	P	C
4	0	0	4

AIM:

The aim of this course is to understand the concepts of software defined radio.

OBJECTIVES:

The students should be made to be

- Understand the concepts of software defined radio
- Learn spectrum sensing and dynamic spectrum access

UNIT I: Introduction to SDR 9

The Need for Software Radios-Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio.Radio frequency implementation issues-The Purpose of the RF Front-End. Dynamic Range: The Principal Challenge of Receiver Design. RF Receiver Front-End Topologies. Enhanced Flexibility of the RF Chain with Software Radios. Importance of the Components -Transmitter Architectures and their Issues. Noise and Distortion in the RF Chain. ADC and DAC Distortion.

UNIT II : Direct Digital Synthesis 9

Introduction. Comparison of Direct Digital Synthesis with Analog Signal Synthesis. Approaches to Direct Digital Synthesis. Analysis of Spurious Signals. Spurious Components due to Periodic Jitter. Band pass Signal Generation. Performance of Direct Digital Synthesis Systems. Hybrid DDS-PLL Systems. Applications of direct Digital Synthesis. Generation of Random Sequences. ROM Compression Techniques.

UNIT III Signal Processor and Multi Rate Processing Techniques 9

Introduction. Sample Rate Conversion Principles. Polyphase Filters. Digital Filter Banks. Timing Recovery in Digital Receivers Using Multirate Digital Filters.

DSP Processors; Field Programmable Gate Arrays; Trade-Offs in Using DSPs, FPGAs, and ASICs; Power Management Issues; Using a Combination of DSPs, FPGAs, and ASICs.

UNIT IV: Smart Antennas 9

Vector channel modeling; Benefits of smart antennas; Structures for Beam forming Systems; Smart Antenna Algorithms.Diversity and Space-Time Adaptive Signal Processing; Algorithms for Transmit STAP; Hardware Implementation of Smart Antennas; Array Calibration.

UNIT V: Applications –Wireless Aspects of Tele-Health Care

The application of advanced telecommunication , the special requirements especially related to reliability, privacy and trust, Regulatory and safety aspects of tele-health care, Cognitive radio and flexible spectrum usage for tele-healthcare, Cooperative Communications for Tele-health. Case studies: JTRS radio system ,Software defined base stations.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Compare MAC and network layer design for software defined radio
- Discuss cognitive radio for Internet of Things and M2M technologies

BOOKS FOR REFERENCES:

1. Jeffrey H. Reed -Software Radio: A Modern Approach to Radio EngineeringPublisher: Prentice Hall PTR; May 2002 ISBN: 0170811580.
2. Wireless Communications: Principles and Practice, 2nd ed,by Rappaport, Prentice-Hall 2002. ISBN 0-17-042232-0.
3. Wireless Application Development, by Skelton, Thomson, 2003, ISBN 0-619-15931-6

SEMESTER III

ELECTIVE IV

17271E32B SATELLITE COMMUNICATION L T P C

4 0 0 4

AIM:

To understand the basics of satellite orbits.To understand the satellite segment and earth segment.

OBJECTIVES:

The students should be made to be

- Learn M2M developments and satellite applications
- Understand Satellite Communication In Ipv6 Environment

UNIT I ORBITAL MECHANICS 9

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations,Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT II SPACECRAFT SUBSYSTEMS AND EARTH STATION 9

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems,Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III SPACE LINKS 9

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS 9

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS).Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures.
Hybrid satellite-terrestrial networks

UNIT V SERVICES AND APPLICATIONS 9

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS,INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Videoconferencing and Internet connectivity.

Total:45 Periods

OUTCOMES:

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

- Discuss satellite navigation and global positioning system
- Outline deep space networks and inter planetary missions

BOOKS FOR REFERENCES:

1. Dennis Roddy, "Satellite Communications", 3rd Edition, Mc Graw Hill International Editions, 2001
2. Bruce R.Elbert, "Introduction to Satellite Communication" , Artech House Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, "Satellite Communications", 2nd Edition, Wiley, John& Sons, 2002
4. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson, "Satellite Communication SystemsEngineering", 2nd Edition, Prentice Hall, New Jersey, 1993
5. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.1990

SEMESTER III

ELECTIVE IV

17271E32C **CDMA SYSTEMS** **L T P C**
4 0 0 4

AIM:

The aim of this course is to define the basics of cellular communications and explain the Architecture OF GSM & its Radio Channels.

OBJECTIVES:

The students should be made to be

- understand cellular concept, widely popular 2G digital, TDMA based mobile system GSM and modern mobile wireless system CDMA.

UNIT I BASIC CONCEPTS OF CDMA **9**

Spread spectrum communication techniques (DS-CDMA, FH-CDMA),Synchronization in CDMA system, Detection and False alarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

UNIT II IS-95 CDMA TECHNIQUES **9**

Spreading Codes , Power control, Handover techniques, Physical and logical channels and processing (Forward and reverse links)

UNIT III WCDMA / CDMA 2000 **9**

Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation & demodulation process , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS **9**

Multicarrier CDMA, System design , Performance parameters – BER lower bound,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA **9**

Prime Codes and its properties, Generalized and Extended Prime Codes,Experimental demonstration of Optical CDMA, Synchronization of Optical CDMAnetworks, Multiwavelength Optical CDMA networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Define the basics of cellular communications.
- Explain the Architecture OF GSM & its Radio Channels.
- Distinguish between GSM & CDMA Technology
- Interpret the practical applicability of above concepts.

BOOKS FOR REFERENCES

1. John G.Proakis, “Digital Communications”, McGraw Hill International Ltd,4th ed., Singapore, 2000.
2. Andrew J. Viterbi, “ CDMA: Principles of Spread SpectrumCommunication”,Addison-Wesley, 1sted. , 1995.
3. Kaveth Pahlavan,. K. Prashanth Krishnamuorthy, "Principles of WirelessNetworks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, “IS –95 CDMA and CDMA 2000: Cellular/PCS SystemsImplementation”, Pearson Education , 2st ed. , 2003.

5. Richard Van Nee, Ramjee Prasad, " OFDM for Wireless MultimediaCommunication" , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, "Wireless Communication", Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, "GSM CDMA One and 3GSystems", Wiley India, 2004.
8. Guu-Chang Yang, "Prime Codes with Application to Optical and WirelessNetworks", Artech House, Inc., 2002.

SEMESTER III

ELECTIVE IV

17271E32D SPEECH PROCESSING AND SYNTHESIS **L T P C**
4 0 0 4

AIM:

To familiarize the students with the various speech signal representation, coding and recognition techniques.

OBJECTIVES:

- To understand the mathematical foundations needed for speech processing
- To understand the basic concepts and algorithms of speech processing and synthesis
- To appreciate the use of speech processing in current technologies and to expose the students to real– world applications of speech processing

UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral Processing– Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

UNIT III SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques

UNIT IV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation schematic – Speaking Style – Symbolic Prosody – Duration Assignment – Pitch Generation.

UNIT V SPEECH SYNTHESIS 9

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the various temporal, spectral and cepstral features required for identifying speech units – phoneme, syllable and word
- Determine and apply Mel-frequency cepstral coefficients for processing all types of signals

- Justify the use of formant and concatenative approaches to speech synthesis
- Identify the apt approach of speech synthesis depending on the language to be processed
- Determine the various encoding techniques for representing speech.

REFERENCES:

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, "Spoken Language Processing – A guide to Theory, Algorithm and System Development", Prentice Hall PTR, 2001.
2. Thomas F.Quatieri, "Discrete-Time Speech Signal Processing", Pearson Education, 2002.
3. Lawrence Rabiner and Biing-Hwang Juang, "Fundamentals of Speech Recognition", Prentice Hall Signal Processing Series, 1993.
4. Sadaoki Furui, "Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications)", Marcel Dekker, 2000.
5. Joseph Mariani, "Language and Speech Processing", Wiley, 2009.

SEMESTER III
ELECTIVE - V

17271E33A WAVELETS AND MULTIRESOLUTION PROCESSING **L T P C**

4 0 0 4

AIM:

To introduce the fundamentals concepts of wavelet transforms.

OBJECTIVE:

- To study system design using Wavelets
- To learn the different wavelet families & their applications.

UNIT I INTRODUCTION 9

Vector Spaces - properties - dot product - basis - dimension, orthogonality and orthonormality - relationship between vectors and signals - Signal spaces - concept of Convergence – Generalised Fourier Expansion.

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA Wavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks

UNIT III CONTINUOUS WAVELET TRANSFORM 9

Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet,Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time -scale plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Bank and sub band coding principles - Wavelet Filters - Inverse DWT computation by Filter banks -Basic Properties of Filter coefficients - Choice of wavelet function coefficients - Derivations of Daubechies Wavelets - Multi-band Wavelet transforms. Introduction to lifting Scheme.

UNIT V APPLICATIONS 9

Signal Compression – Image Compression techniques: EZW-SPHIT Coding - Image denoising techniques:Noise estimation - Shrinkage rules -. Shrinkage Functions - Edge detection and object Isolation, Image Fusion, and Object Detection.

TOTAL : 45 PERIODS

OUTCOME:

- The students will be able to apprehend the detailed knowledge about the Wavelet transforms & its applications.

BOOKS FOR REFERENCES:

1. Rao .R.M and A.S.Bopardikar, "Wavelet Transforms: Introduction to theory and Applications",Pearson Education Asia Pte. Ltd., 2000.
2. Strang G, Nguyen T, "Wavelets and Filter Banks," Wellesley Cambridge Press, 1996
3. Vetterli M, Kovacevic J., "Wavelets and Sub-band Coding," Prentice Hall, 1995
4. Mallat S., "Wavelet tour of Signal Processing", Academic Press, 1996
5. David C.Lay., "Linear Algebra and its applications" Pearson education, 2007.(Unit I only)

SEMESTER III
ELECTIVE – V

17271E33B HIGH PERFORMANCE COMMUNICATION NETWORKS L T P C
4 0 0 4

AIM:

To familiarize concepts and terminology associated with ATM, Frame Relay, MPLS, Bluetooth technology**.**

OBJECTIVES:

- To appreciate the need for interoperable network management as a typical distributed

application
- To be aware of current trends in network technologies

UNIT I PACKET SWITCHED NETWORKS **9**

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI,DQDB, SMDS: Internetworking with SMDS

UNIT II ISDN AND BROADBAND ISDN **9**

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)-Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY **9**

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer,management and control, ATM switching and transmission.

Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM,Frame relay via ATM.

UNIT IV ADVANCED NETWORK ARCHITECTURE **9**

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V BLUETOOTH TECHNOLOGY **9**

The Bluetooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller,Audio, The Link Manager, The Host controller interface; The Bluetooth module-Protocol stack Part I:Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Diagnose problems and make minor repairs to computer networks using appropriate diagnostics software b
- Demonstrate how to correctly maintain LAN computer systems
- Maintain the network by performing routine maintenance tasks
- Apply network management tools

BOOKS FOR REFERENCES:

1. William Stallings,"ISDN and Broadband ISDN with Frame Relay and ATM", 4th edition, Pearsoneducation Asia, 2002.
2. Leon Gracia, Widjaja, "Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Jennifer Bray and Charles F.Sturman,"BlueTooth" Pearson education Asia, 2001.
4. Sumit Kasera, Pankaj Sethi, "ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
5. Rainer Handel, Manfred N.Huber and Stefan Schroder ,"ATM Networks",3rd edition, Pearsoneducation asia,2002.
6. Jean Walrand and Pravin Varaiya ,"High Performance Communication networks",2nd edition,Harcourt and Morgan Kauffman,London,2000.
7. William Stallings,"High-speed Networks and Internets", 2nd edition, Pearson education Asia, 2003.

17271E33C ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P C
4 0 0 4

AIM:

To introduce the advanced features in microprocessors and microcontrollers.

OBJECTIVES:

- To enable the students to understand various microcontroller architectures
- To expose the students to the fundamentals of microprocessor architecture.

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline –pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipelining – Branch prediction – The instruction and caches –Floating point unit –protected mode operation – Segmentation – paging – Protection – multitasking –Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing -Instruction types –Addressing modes – Processor flags – Instruction set - programming the Pentium processor.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE :ARM 9

The ARM architecture – ARM assembly language program – ARM organization and implementation –The ARM instruction set - The thumb instruction set – ARM CPU cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – ParallelI/O ports – Flags – Real time clock – Programmable timer – pulse accumulator – serial communication interface – A/D converter – hardware expansion – Assembly language Programming

UNIT V PIC MICROCONTROLLER 9

CPU architecture – Instruction set - Interrupts – Timers – I/O port expansion –I2C bus for peripheral chip access – A/D converter – UART

TOTAL : 45 PERIODS

OUTCOMES:

- The student will be able to work with a suitable microprocessor / microcontroller for a specific real world application.

BOOKS FOR REFERENCES:

1. Daniel Tabak , ‘’ Advanced Microprocessors” McGraw Hill.Inc., 1995
2. James L. Antonakos, “The Pentium Microprocessor ‘’ Pearson Education, 1997.
3. Steve Furber, ‘’ ARM System –On –Chip architecture “Addison Wesley, 2000.
4. Gene .H.Miller.” Micro Computer Engineering,” Pearson Education, 2003.
5. John .B.Peatman, “Design with PIC Microcontroller, Prentice hall, 1997.

6. James L.Antonakos, An Introduction to the Intel family of Microprocessors", Pearson Education 1999.
7. Barry.B.Breg," The Intel Microprocessors Architecture , Programming and Interfacing ", PHI, 2002.
8. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001

Readings : Web links: www.ocw.nit.edu,www.arm.com,

ELECTIVE - V

17271E33D RECONFIGURABLE COMPUTING

L T P C
4 0 0 4

AIM:

To examine the various reconfigurable computing systems.To understand the different types of compute models for programming reconfigurable architectures

OBJECTIVES

- To understand the need for reconfigurable computing
- To expose the students to various device architectures
- To expose the students to HDL programming and familiarize with the development environment
- To expose the students to the various placement and routing protocols
- To develop applications with FPGAs

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing – Simple Programmable Logic Devices – Complex Programmable Logic Devices – FPGAs – Device Architecture - Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures – RPF Integration into Traditional Computing Systems – Reconfigurable Computing Systems – Case Studies –Reconfiguration Management.

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

Compute Models - Programming FPGA Applications in HDL – Compiling C for Spatial Computing-Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

The Design Flow - Technology Mapping – FPGA Placement and Routing –Configuration Bitstream Generation – Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGAS 9

Case Studies of FPGA Applications – System on a Programmable Chip (SoPC) Designs.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Identify the need for reconfigurable architectures
2. Discuss the architecture of FPGAs
3. Point out the salient features of different reconfigurable architectures
4. Build basic modules using any HDL
5. Develop applications using any HDL and appropriate tools
6. Design and build an SoPC for a particular application

REFERENCES:

1. Maya B. Gokhale and Paul S. Graham, “Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays”, Springer, 2005.
2. Scott Hauck and Andre Dehon (Eds.), “Reconfigurable Computing – The Theory and Practice of FPGA-Based Computation”, Elsevier / Morgan Kaufmann, 2008.

3. Christophe Bobda, “Introduction to Reconfigurable Computing – Architectures, Algorithms and Applications”, Springer, 2010.

SEMESTER III
ELECTIVE - VI

17271E34A SIMULATION OF COMMUNICATION NETWORKS **L T P C**
4 0 0 4

AIM:

The aim of this course is to learn modeling and simulation.

OBJECTIVES:

The students should be made to be

- Learn modeling and simulation
- Understand Monte Carlo simulation
- Study channel modeling and mobility modeling

UNIT I MODELLING OF COMMUNICATION SYSTEM 9

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Lightwave system models.

UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and multivariate models, Transformation of random variables, Bounds and approximation, Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

UNIT III ESTIMATION OF PERFORMANCE MEASURES 9

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system, BER of digital communication systems, Monte Carlo method and Importance of sampling method,estimation of power spectral density

UNIT IV COMMUNICATION NETWORKS 9

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem ,M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

UNIT V NETWORK OF QUEUES 9

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flowchart, Routing model, Network layout and Reliability

TOTAL : 45 PERIODS

OUTCOMES:

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

- Apply Monte Carlo simulation
- Discuss Lower Layer and Link Layer Wireless Modeling
- Compare channel modeling and mobility modeling

BOOKS FOR REFERENCES:

1. M.C.Jeruchim,Philip Balaban and K.Sam Shanmugan, "Simulation of communication systems",Springer, 2nd Edition, 2002.
2. A.M.Law and W.David Kelton, "Simulation Modelling and analysis", 3rd Edition, Mc Graw Hill Inc.,1999.
3. J.F.Hayes, “Modeling and Analysis of Computer Communication networks (Applications ofCommunication Theory)”, Plenum Press, 1984.
4. Jerry Banks and John S.Carson and Barry L. Nelson, “Discrete-Event System Simulation”, 4th Edition,Prentice Hall Inc., 2004.

SEMESTER III

17271E34B **MEDICAL IMAGING** **L T P C**
4 0 0 4

AIM:

To study the production of x-rays and its application to different medical Imaging techniques. To study the different types of Radio diagnostic techniques.

OBJECTIVES:

- To study the special imaging techniques used for visualizing the cross sections of the body.
- To study the imaging of soft tissues using ultrasound technique

UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS 8

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II COMPUTER AIDED TOMOGRAPHY 10

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III RADIO ISOTOPIC IMAGING 9

Radiation detectors, Radio isotopic imaging equipment, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV ULTRASONIC SYSTEMS 9

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V MAGNETIC RESONANCE IMAGING 9

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

TOTAL:45 PERIODS

OUTCOMES:

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

- Explain computer aided tomography
- Discuss ultrasonic systems
- Outline magnetic resonance imaging

BOOKS FOR REFERENCES:

1. D.N.Chesney and M.O.Chesney Radiographic imaging, CBS Publications, New Delhi, 1987.
2. Peggy, W., Roger D.Ferimarch, MRI for Technologists, McGraw Hill, New York, 1995.
3. Steve Webb, The Physics of Medical Imaging, Taylor& Francis, New York.1988.

SEMESTER III
ELECTIVE – VI

17271E34C MOBILE ADHOC NETWORKS **L T P C**
4 0 0 4

AIM:

The aim of this course is to understand the basics of Ad-hoc & Sensor Networks.

OBJECTIVES:

- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

UNIT I INTRODUCTION 9

Introduction to Ad Hoc networks – definition, characteristics features, applications.Characteristics of Wireless channel, Ad Hoc Mobility Models: - entity and group models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols,reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast Routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm,Hierarchical Routing, QoS aware routing.

UNITIV END -TO - END DELIVERY AND SECURITY 9

Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNITV CROSS LAYER DESIGN AND INTEGRATION OF AD HOC FOR 4G 9

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:-Architecture, methods of cooperation, co-operative antennas, Integration of
ad hoc networks with other wired and wireless networks.

TOTAL : 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to

- Identify different issues in wireless ad hoc and sensor networks.
- To analyze protocols developed for ad hoc and sensor networks.
- To identify and address the security threats in ad hoc and sensor networks.
- Establish a Sensor network environment for different types of applications.

BOOKS FOR REFERENCES:

1. C.Siva Ram Murthy and B.S.Manoj, “Adhoc Wireless Networks Architectures and protocols”, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, “Adhoc Networking”, Addison – Wesley, 2000.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, “Mobile Ad Hoc networking”, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, “The handbook of adhoc wireless networks”, CRC press,2002.
5. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad HocNetwork Research,” Wireless Communication and Mobile Comp., SpecialIssue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2,no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , “A survey of integrating IP mobility protocols and Mobile Ad hoc networks”, IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”, Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, ” ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”, World Wireless cong., San Francisco, CA,May 2004.

SEMESTER III
ELECTIVE – VI

17271E34D ULTRA WIDEBAND COMMUNICATION **L T P C**
4 0 0 4

AIM:

To give fundamental concepts related to Ultra wide band .

OBJECTIVES:

- To understand the channel model and signal processing for UWB.
- To acquire knowledge about UWB antennas and regulations.

UNIT I INTRODUCTION TO UWB **9**

History, Definition, FCC Mask, UWB features, UWB Interference: IEEE 802.11.a Interference, Signal to Interference ratio calculation, Interference with other wireless services.

UNIT II UWB TECHNOLOGIES AND CHANNEL MODEL **9**

Impulse Radio , Pulsed Multiband, Multiband OFDM, features : Complexity, Power Consumption, Security and achievable data rate. MIMO Multiband OFDM, Differential multiband ofdm, Performance characterization Ultra Wide Band Wireless Channels

Channel model: Impulse Response Modeling of UWB Wireless Channels, IEEE UWB channel model, Path loss, Delay profiles, Time and frequency modeling.

UNIT III UWB SIGNAL PROCESSING **9**

Data Modulation schemes, UWB Multiple Access Modulation, BER, Rake Receiver, Transmit- Reference (T-R) Technique, UWB Range- Data Rate Performance, UWB Channel Capacity UWB Wireless Locationing: Position Locationing Methods, Time of Arrival Estimation, NLOS Location Error , Locationing with OFDM

UNIT IV UWB ANTENNAS **9**

Antenna Requirements, Radiation Mechanism of the UWB Antennas, Types of Broadband antennas, Parameters, Analysis of UWB Antennas, Link Budget for UWB System. Design examples of broad band UWB antennas.

UNIT V UWB APPLICATIONS AND REGULATIONS **9**

Wireless Ad hoc Networking, UWB Wireless Sensor, RFID , Consumer Electronics and Personal,Asset Location, Medical applications UWB Regulation and standards in various countries , UWB Regulation in ITU, IEEE Standardization

TOTAL:45 PERIODS

OUTCOMES:

Students learn about

- Radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum.

REFERENCES:

1. Homayoun Nikookar and Ramjee Prasad, “Introduction to Ultra Wideband for Wireless Communications”1st Edition, Springer Science & Business Media B.V. 2009.
2. Thomas Kaiser, Feng Zheng “Ultra Wideband Systems with MIMO”, 1st Edition, John Wiley & Sons Ltd, Newyork, 2010.
3. W. Pam Siriwongpairat and K. J. Ray Liu, “Ultra-Wideband Communications Systems: Multiband OFDM approach” John Wiley and IEEE press, Newyork 2008.

PRIST DEEMED UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

M.TECH - COMMUNICATION SYSTEMS
[PART TIME]

[REGULATION 2017]

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

PEO1: To provide students with strong fundamental concepts and also advanced techniques and tools to build various communication systems.

PEO2: To enable graduates to attain successful professional careers by applying their engineering skills in communication system design to meet out the challenges in industries and academia.

PEO3: To engage graduates in lifelong learning, adapt emerging technology and pursue research for the development of innovative products.

PROGRAM OUTCOMES (POS):

Engineering Graduates will be able to:

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: 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.

PO3: **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.

PO4: 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.

PO5: 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.

PO6: 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.

PO7: 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.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: 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.

PO11: 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.

PO12: 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.

PROGRAMME SPECIFIC OBJECTIVES (PSOs):

PSO1: To inculcate the ability in graduates to design and analyze the subsystems such as RF, Signal processing, Modern communication systems and networks.

PSO2: To enhance problem solving skills in communication systems design using latest hardware and software tools.

PSO3: To apply communication engineering principles and practices for developing products for scientific and business applications.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES (PEOs) WITH PROGRAMME OUTCOMES (POs):

The mapping between the Programme Educational Objectives (PEOs) and the Programme Outcomes (POs) is given in the following table:

PROGRAMME EDUCATIONAL OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
PEO1	√	√	√	√	√	√	-	-	√	-	-	√
PEO2	√	√	√	√	√	√	√	√	√	√	√	√
PE03	√	√	√	√	√	√	√	√	√	√	√	√

Contribution 1: Reasonable 2: Significant 3: Strong

MAPPING OF PROGRAM SPECIFIC OBJECTIVES (PSOs) WITH PROGRAMME OUTCOMES (POs):

A broad relation between the Programme Specific Objectives (PSOs) and the Programme Outcomes(POs) is given in the following table:

PROGRAMME SPECIFIC OBJECTIVES	PROGRAMME OUTCOMES											
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12
PSO1	√	√	√	√	√	√	-	-	√	-	-	√
PSO2	√	√	√	√	√	√	√	√	√	√	√	√
PS03	√	√	√	√	√	√	√	√	√	√	√	√

Contribution 1: Reasonable 2: Significant 3: Strong

M.TECH - COMMUNICATION SYSTEMS (PART TIME) – R2017

SEMESTER I

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	17248S11BP	Applied mathematics for Electronics Engineering	3	1	0	4
2	17271C12P	Statistical Signal Processing	3	1	0	4
3	17271C13P	Modern Digital Communication Systems	3	1	0	4
Practical						
4	17271L14P	Communication Systems Lab - I	0	0	3	3
Research Skill Development (RSD) Course						
5	17271CRSP	Research Led Seminar	1	0	0	**1**
Total Credits						**16**

SEMESTER II

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	17271C21P	Mobile Communication Networks	4	0	0	4
2	17271C22P	Advanced Microwave Systems	4	0	0	4
3	17271E23_P	**Elective-I**	4	0	0	**4**
Practical						
4	17271L24P	Communication Systems Lab - II	0	0	3	3
5	172TECWRP	Technical Writing /Seminars	0	0	3	3
Research Skill Development (RSD) Course						
6	17271CRMP	Research Methodology	3	0	0	**3**
7	17271CBRP	Participation in Bounded Research	0	0	2	**2**
Total Credits						**23**

SEMESTER III

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	17271C31P	Communication Protocol Engineering	4	0	0	4
2	17271C32P	Advanced Radiation Systems	4	0	0	4
3	17271E33_P	**Elective – II**	4	0	0	4
Research Skill Development (RSD) Course						
4	17271CSRP	Design/socio technical project	0	0	4	**4**
Total Credits						**16**

SEMESTER IV

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	17271C41P	Wireless Sensor Networks	4	0	0	4
2	17271C42P	Fiber Optic Networking	4	0	0	4
3	17271C43_P	**Elective-III**	4	0	0	4
Project						
4	17271P44P	Project Phase – I	0	0	6	6

Total Credits	18

SEMESTER V

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	17271E51_P	**Elective-IV**	4	0	0	4
2	17271E52_P	**Elective-V**	4	0	0	4
3	17271E53_P	**Elective-VI**	4	0	0	4
Total Credits						**12**

SEMESTER VI

S.N	SUB CODE	SUBJECT	L	T	P	C
1	17271P61P	Project Phase – II	0	0	12	12
Total Credits						**12**
Total Credits for the Programme						**97**

LIST OF ELECTIVES

Elective-I (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	1727E23AP	High Speed Switching Architecture	4	0	0	4
2.	17271E23BP	DSP Processor Architecture and Programming	4	0	0	4
3.	17271E23CP	Digital Speech Processing	4	0	0	4
4.	17271E23DP	ASIC and FPGA Design	4	0	0	4

Elective-II (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E33AP	Internetworking and Multimedia	4	0	0	4
2.	17271E33BP	Digital Image Processing	4	0	0	4
3.	17271E33CP	LASER Communication	4	0	0	4
4.	17271E33DP	MEMS and NEMS	4	0	0	4

Elective-III (SEMESTER – IV)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E43AP	Digital Communication Receivers	4	0	0	4
2.	17271E43BP	Soft Computing	4	0	0	4
3.	17271E43CP	Communication Network Security	4	0	0	4
4.	17271E43DP	Radar Signal Processing	4	0	0	4

Elective-IV (SEMESTER – V)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E51AP	Software Defined Radio	4	0	0	4
2.	17271E51BP	Satellite Communication	4	0	0	4
3.	17271E51CP	CDMA Systems	4	0	0	4
4.	17271E51DP	Speech Processing and Synthesis	4	0	0	4

Elective-V (SEMESTER – V)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E52AP	Wavelets and Multi Resolution Processing	4	0	0	4
2.	17271E52BP	High performance Communication Networks	4	0	0	4
3.	17271E52CP	Advanced Microprocessors and Microcontrollers	4	0	0	4
4.	17271E52DP	Reconfigurable computing	4	0	0	4

Elective-VI (SEMESTER – V)

S. N	SUB CODE	SUBJECT	L	T	P	C
1.	17271E53AP	Simulation of Communication Networks	4	0	0	4
2.	17271E53BP	Medical Imaging	4	0	0	4
3.	17271E53CP	Mobile ADHOC networks	4	0	0	4
4.	17271E53DP	Ultra Wide Band Communication	4	0	0	4

M.TECH (PART TIME) - COMMUNICATION SYSTEMS

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Sem.	Core Courses						Elective Courses		Total Credits
	Theory Courses		Practical Courses		Courses on *RSD				
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	03	12	01	03	01	01	-	-	16
II	02	08	02	06	02	05	01	04	23
III	02	08	-	-	01	04	01	04	16
IV	02	08	-	-	01	06	01	04	18
V	-	-	-	-	-	-	03	12	12
VI	-	-	-	-	01	12	-	-	12
Total Credits									97

HOD **DEAN**

SEMESTER I

17248S11PB APPLIED MATHEMATICS FOR ELECTRONICS ENGINEERS 3 1 0 4

UNIT I CALCULUS OF VARIATIONS 9

Functional – Euler's equation-Variational problems involving one unknown function-several unknown functions-functional dependent on higher order derivatives-several independent variables-isoperimetric problems.

UNIT II INTEGRAL TRANSFORMS AND WAVE EQUATIONS 9

Fourier transform pairs, Properties – Fourier Sine and Cosine transforms, Convolution integrals, Evaluation of integrals using Fourier Transform. Discrete Fourier Transform -properties.Application of Fourier transform to wave equation.Z-transform-properties-inverse transform- solution to difference equation.

UNIT III LINEAR PROGRAMMING 9

Simplex algorithm-two phase method-duality-transportation and assignment problems-inventory-scheduling.

UNIT IV RANDOM PROCESS AND QUEUING THEORY 9

Classification – auto correlation-cross correlation-ergodicity-power spectral density function-Poisson process.Single and multiple server Markovian queuing models- customer impatience- queuing applications.

UNIT V TESTING OF HYPOTHESIS 9

Sampling distributions-Testing of hypothesis of normal, t, chi square, F distributions for testing mean and variance- large sample test. Analysis of variance – one way classification.

Tutorial: 15 **Total:60**

BOOKS FOR REFERENCES:

1 M.K.Venkataraman , "Higher Mathematics for Engineering & Science", National Publishing Company,2000
2 Kandasamy, "Engineering Mathematics Volume – II", S.Chand & Co., 2001.
3 P.K.Gupta , D.S.Hira, "Operations Research", S.Chand &Co., 1999
4 T.Veerarajan,"Probability, Statistics & Random Processes", TMH, 2002.

SEMESTER I

3 1 0 4

17271H12P STATISTICAL SIGNAL PROCESSING

UNIT I DISCRETE RANDOM SIGNAL PROCESSING

Discrete Random Processes-, Autocorrelation and Auto covariance matrices. Parseval's Theorem, Wiener - Khintchine Relation- Power Spectral Density-Periodogram -, Parameter estimation: Bias and consistency.

UNIT II SPECTRUM ESTIMATION

Non-Parametric Methods-Correlation Method, Periodogram Estimator, Performance Analysis of Estimators –Unbiased Consistent Estimators-; Bartlett, Blackman –Tukey method.
Parametric Methods - AR, MA, and ARMA model based spectral estimation.

UNIT III LINEAR ESTIMATION AND PREDICTION

Linear prediction- Forward and backward predictions, - Levinson-Durbin algorithms. Least mean squared error criterion -Wiener filter for filtering and prediction, FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter

UNIT IV ADAPTIVE FILTERS

FIR adaptive filters -adaptive filter based on steepest descent method-Widrow-Hoff LMS adaptive algorithm Adaptive recursive filters (IIR). RLS adaptive filters- Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING

Mathematical description of change of sampling rate - Interpolation and Decimation, Decimation by an integer factor - Interpolation by an integer factor, Filter implementation for sampling rate conversion-Application to sub band coding and Filter bank implementation of wavelet expansion of signals.

Tutorial :15 **Total:60**

BOOKS FOR REFERENCES:

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.
2. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing Pearson Education, 2002.
3. John G. Proakis et.al.,'Algorithms for Statistical Signal Processing', Pearson Education, 2002.
4. Dimitris G.Manolakis et.al.,'Statistical and adaptive signal Processing', McGraw Hill, Newyork,2000.

17271H13P MODERN DIGITAL COMMUNICATION SYSTEMS 3 1 0 4

UNIT I COHERENT AND NON-COHERENT COMMUNICATION:
Coherent receivers – Optimum receivers in WGN – IQ modulation & demodulation – Noncoherent receivers in random phase channels; M-FSK receivers – Rayleigh and Rician channels – Partially coherent receives – DPSK; M-PSK; M-DPSK,-BER Performance Analysis.

UNIT II
BANDLIMITED CHANNELS AND DIGITAL MODULATIONS:
Eye pattern; demodulation in the presence of ISI and AWGN; Equalization techniques – IQ modulations;QPSK; QAM; QBOM; -BER Performance Analysis. – Continuous phase modulation; CPFM; CPFSK;MSK,OFDM.

UNIT III
BLOCK CODED DIGITAL COMMUNICATION:
Architecture and performance – Binary block codes; Orthogonal; Biorthogonal; Transorthogonal – Shannon's channel coding theorem; Channel capacity; Matched filter; Concepts of Spread spectrum communication – Coded BPSK and DPSK demodulators – Linear block codes; Hammning; Golay;Cyclic; BCH ; Reed – Solomon codes..

UNIT IV
CONVOLUTIONAL CODED DIGITAL COMMUNICATION:
Representation of codes using Polynomial, State diagram, Tree diagram, and Trellis diagram – Decoding techniques using Maximum likelihood, Viterbi algorithm, Sequential and Threshold methods – Error probability performance for BPSK and Viterbi algorithm, Turbo Coding.

UNIT V
SPREAD SPECTRUM SIGNALS FOR DIGITAL COMMUNICATION
Model of spread Spectrum Digital Communication System-Direct Sequence Spread Spectrum Signals,Error rate performance of the coder, Generation of PN Sequences- Frequency-Hopped Spread Spectrum Signals, Performance of FH Spread Spectrum Signals in an AWGN Channel-Synchronization of Spread Spectrum Systems.
Tutorial :15 **Total:60**

BOOKS FOR REFERENCES:

1. M.K.Simon, S.M.Hinedi and W.C.Lindsey, Digital communication techniques; Signalling and detection, Prentice Hall India, New Delhi. 1995.
2. Simon Haykin, Digital communications, John Wiley and sons, 1998
3. Wayne Tomasi, Advanced electronic communication systems, 4th Edition Pearson EducationAsia, 1998
4. B.P.Lathi Modern digital and analog communication systems, 3rd Edition, Oxford Universitypress 1998.
5. John G. Proakis, Digital Communications, 4th Edition, McGraw-Hill, New York , 2001

17271L14P **0 0 3 3**

COMMUNICATION SYSTEM LABORATORY-I

1. Antenna Radiation Pattern measurement.
2. Simulation of Modulation and Coding in a AWGN Communication Channel using Simulation Packages.
3. Implementation of Adaptive Filters, periodogram and multistage multirate system in DSP Processor
4. Performance evaluation of Digital Data Transmission through Fiber Optic Link.
5. Study of Spread Spectrum Techniques.
6. Simulation of QMF using Simulation Packages.
7. Implementation of Video Link using Optical Fiber.
8. Implementation of Linear and Cyclic Codes.

17271H21P MOBILE COMMUNICATION NETWORKS 4 0 0 4

UNIT I OPERATION OF MOBILE COMMUNICATION NETWORKS

Operation of first, second, and third generation wireless networks: cellular systems, medium access techniques, Mobile networks Elementary Principles of cellular Telephony Channel Division Techniques (TDMA, FDMA, CDMA) Cellular Coverage Methods Network Planning and Resource Allocation,Network Dimensioning ,Mobility Management Procedures

UNIT II PROPAGATION MODELS AND AIR PROTOCOLS

Radio propagation models, error control techniques, handoff, power control, Soft handover, Forward link ,Reverse link , common air protocols (AMPS, IS-95, IS-176, GSM, GPRS, EDGE, WCDMA, cdma2000,etc)

UNIT III MOBILE NETWORK ARCHITECTURE

General Architecture definition, Mobile Terminals (MT, SIM)
Radio Section (BTS, BSC) Core Network (MSC, G-MSC, VLR, HLR, AuC)
User and Control Plane Protocol Stack, MAP & SS#7, the Key Role of Signaling Interfaces and Network Entities Relation The Physical Channel, The Logical Channels Terminal, Call and Network Management Procedures, Network Planning.

UNIT IV WIRELESS LOCAL AREA NETWORKS

Wireless Local Area Networks , General Characteristics of the Hyper LAN System, 802.11 Standard, Basic DCF access scheme DCF Access Scheme with Handshaking, PCF Access Scheme, The 802.11a Standard, Mobile Ad Hoc Networks, Wireless Sensor Networks, Routing Energy Efficiency, Localization, Clustering.

UNIT V SECURITY ISSUES IN WIRELESS NETWORKS

Security in Wireless Networks, Secure routing, Key Pre-distribution and Management, Encryption and Authentication, Security in Group Communication, Trust Establishment and Management, Denial of Service Attacks, Energy-aware security mechanisms, Location verification, Security on Data fusion.

BOOKS FOR REFERENCES:

1. W. Stallings, "Wireless Communications and Networks",Second Edition Prentice Hall, 2007.
2. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
3. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall,2002.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and Key Architectures", McGraw-Hill, 2000.
5. J.Schiller,"Mobile Communications", Addison Wesley, 2000.
6. Fred Halsall, "Multimedia Communications, Applications, Networks, Protocols and Standards",Addison Wesley, 2001.
7. Uyless Black ,"Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

17271H22P ADVANCED MICROWAVE SYSTEMS 4 0 0 4

UNIT I TECHNOLOGY OF HYBRID MICS

Dielectric substrates - thick film technology and materials - thin film technology and materials – methods of testing – encapsulation of devices for MICs – mounting of active devices.

UNIT II TECHNOLOGY OF MONOLITHIC MICS

Processes involved in fabrication – epitaxial growth of semiconductor layer – growth of dielectric layer –diffusion-ion implantation – electron beam technology.

UNIT III ANALYSIS OF MICROSTRIP LINE

Methods of conformal transformation – numerical method for analysis – hybrid mode analysis – coupled mode analysis- method of images – losses in miscrostrips.

UNIT IV COUPLED MICROSTRIPS, SLOT LINE AND COPLANAR VEGUIDES

Coupled microstrips – even and odd mode analysis – microstrip directional couplers – branch line couplers– periodic branch line couplers – synchronous branch line couplers.

UNIT V LUMPED ELEMENTS AND NON-RECIPROCAL COMPONENTS

Design and fabrication using microstrips – flat resistors – flat inductors – interdigital capacitors – sandwich capacitors – ferromagnetic substrates for non-reciprocal devices – microstrip circulators – latching circulators – isolators – phase shifters.

BOOKS FOR REFERENCES:

1. Gupta,K.C, and Amarjit singh – "Microwave Integrated Circuits" – John Wiley and sons – Wiley Eastern Reprint, 1978.
2. Hoffmann, R.K – "Handbook of Microwave Integrated Circuits" – Artech House, 1987.

17271L24P COMMUNICATION SYSTEMS LABORATORY-II
0 0 3 3

1. Simulation of Audio and speech compression algorithms
2. Simulation of EZW / SPIHT Image coding algorithm.
3. Simulation of Microstrip Antennas
4. S-parameter estimation of Microwave devices.
5. Study of Global Positioning System.
6. Performance evaluation of simulated CDMA System.
7. Design and testing of a Microstrip coupler.
8. Characteristics of $\lambda/4$ and $\lambda/2$ transmission lines.

SEMESTER II
ELECTIVE - I

17271E23AP HIGH SPEED SWITCHING ARCHITECTURE
4 0 0 4

UNIT I HIGH SPEED NETWORK 9
LAN and WAN network evolution through ISDN to BISDN - Transfer mode and control of BISDN - SDH multiplexing structure - ATM standard; ATM adaptation layers.

UNIT II LAN SWITCHING TECHNOLOGY 9

Switching concepts; Switch forwarding techniques; switch path control - LAN switching; cut through forwarding; store and forward - virtual LANs.

UNIT III ATM SWITCHING ARCHITECTURE 9

Switch models - Blocking networks – basic and enhanced banyan networks - sorting networks – merge sorting - rearrangeable networks - full and partial connection networks - nonblocking networks – recursive network – construction and comparison of non-blocking network - switches with deflection routing – shuffle switch - tandem banyan.

UNIT IV QUEUES IN ATM SWITCHES 9

Internal queuing – Input, output and shared queuing - multiple queuing networks –combined input,output and shared queuing – performance analysis of queued switches.

UNIT V IP SWITCHING 9

Addressing mode - IP switching types-flow driven and topology driven solutions - IP Over ATM address and next hop resolution – multicasting - IPv6 over ATM.

Total: 45

BOOKS FOR REFERENCES:

1. Achille Patavina, Switching Theory: Architectures and performance in Broadband ATM Networks.John Wiley & Sons Ltd., New York.1998.
2. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York.1998.
3. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications,3rd Edition, Adisson Wesley, New York,1999.
4. John A.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, NewYork, 1998.

SEMESTER II
ELECTIVE - I

17271E23BP DSP PROCESSOR ARCHITECTURE AND PROGRAMMING
4 0 0 4

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs

Multiplier and Multiplier accumulator (MAC) – Modified Bus Structures and Memory access in Programmable DSPs – Multiple access memory – Multi-port memory – VLIW architecture- Pipelining –Special Addressing modes in P-DSPs – On chip Peripherals.

UNIT II TMS320C3X PROCESSOR

Architecture – Data formats - Addressing modes – Groups of addressing modes- Instruction sets - Operation – Block Diagram of DSP starter kit – Application Programs for processing real time signals –Generating and finding the sum of series, Convolution of two sequences, Filter design

UNIT III ADSP PROCESSORS

Architecture of ADSP-21XX and ADSP-210XX series of DSP processors- Addressing modes and assembly language instructions – Application programs –Filter design, FFT calculation.

UNIT IV ADVANCED PROCESSORS I

Architecture of TMS320C54X: Pipe line operation, Addressing modes and assembly language instructions Introduction to Code Composer studio

UNIT V
ADVANCED PROCESSORS II

Architecture of TMS320C6X - Architecture of Motorola DSP563XX – Comparison of the features of DSP family processors.

BOOKS FOR REFERENCES:

1. B.Venkataramani and M.Bhaskar, “Digital Signal Processors – Architecture, Programming and Applications” – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.
2. User guides Texas Instrumentation, Analog Devices, Motorola.

SEMESTER II
ELECTIVE - I

17271E23CP

DIGITAL SPEECH PROCESSING

4 0 0 4

UNIT I MECHANICS OF SPEECH

Speech production mechanism – Nature of Speech signal – Discrete time modelling of Speech production – Representation of Speech signals – Classification of Speech sounds – Phones – Phonemes – Phonetic and Phonemic alphabets – Articulatory features.

Music production – Auditory perception – Anatomical pathways from the ear to the perception of sound – Peripheral auditory system – Psycho acoustics

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING

Time domain parameters of Speech signal – Methods for extracting the parameters Energy, Average Magnitude – Zero crossing Rate – Silence Discrimination using ZCR and energy – Short Time Auto Correlation Function – Pitch period estimation using Auto Correlation Function

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING

Short Time Fourier analysis – Filter bank analysis – Formant extraction – Pitch Extraction – Analysis by Synthesis- Analysis synthesis systems- Phase vocoder—Channel Vocoder. Homomorphic speech analysis: Cepstral analysis of Speech – Formant and Pitch Estimation –

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH

Formulation of Linear Prediction problem in Time Domain – Basic Principle – Auto correlation method– Solution of LPC equations — Durbin's Recursive algorithm – lattice formation and solutions – Comparison of different methods — Formant analysis – VELP – CELP.

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING

Algorithms: Spectral Estimation, dynamic time warping, hidden Markov model – Music analysis – Pitch Detection – Feature analysis for recognition – Music synthesis – Automatic Speech Recognition – Feature Extraction for ASR — ASR systems– Voice response system – Speech Synthesis: Text to speech, voice over IP.

BOOKS FOR REFERENCES:

1. Ben Gold and Nelson Morgan, Speech and Audio Signal Processing, John Wiley and Sons Inc. , Singapore, 2004
2. L.R.Rabiner and R.W.Schaffer – Digital Processing of Speech signals – Prentice Hall -1978
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 1972
5. I.H.Witten – Principles of Computer Speech – Academic Press – 1982

17271E23DP **ASIC AND FPGA DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

- To study the design flow of different types of ASIC.
- To familiarize the different types of programming technologies and logic devices.
- To learn the architecture of different types of FPGA.
- To gain knowledge about partitioning, floor planning, placement and routing including circuit extraction of ASIC
- To analyse the synthesis, Simulation and testing of systems.
- To understand the design issues of SOC.
- To know about different high performance algorithms and its applications in ASICs.

UNIT I OVERVIEW OF ASIC AND PLD 9

Types of ASICs - Design flow – CAD tools used in ASIC Design – Programming Technologies: Antifuse – static RAM – EPROM and EEPROM technology, Programmable Logic Devices : ROMs and EPROMs – PLA –PAL. Gate Arrays – CPLDs and FPGAs

UNIT II ASIC PHYSICAL DESIGN 9

System partition -partitioning - partitioning methods – interconnect delay models and measurement of delay - floor planning - placement – Routing : global routing - detailed routing - special routing - circuit extraction - DRC

UNIT III LOGIC SYNTHESIS, SIMULATION AND TESTING 9

Design systems - Logic Synthesis - Half gate ASIC -Schematic entry - Low level design language - PLA tools -EDIF- CFI design representation. Verilog and logic synthesis -VHDL and logic synthesis - types of simulation -boundary scan test - fault simulation - automatic test pattern generation.

UNIT IV FPGA 9

Field Programmable gate arrays- Logic blocks, routing architecture, Design flow technology - mapping for FPGAs, Xilinx XC4000 - ALTERA's FLEX 8000/10000, ACTEL's ACT-1,2,3 and their speed performance

Case studies: Altera MAX 5000 and 7000 - Altera MAX 9000 – Spartan II and Virtex II FPGAs - Apex and Cyclone FPGAs

UNIT V SOC DESIGN 9

Design Methodologies – Processes and Flows - Embedded software development for SOC – Techniques for SOC Testing – Configurable SOC – Hardware / Software codesign Case studies: Digital camera, Bluetooth radio / modem, SDRAM and USB

TOTAL: 45 PERIODS

COURSE OUTCOMES:

- Demonstrate VLSI tool-flow and appreciate FPGA architecture.
- Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.
- Understand the algorithms used for ASIC construction
- Understand the basics of System on Chip, On chip communication architectures like AMBA,AXI and utilizing Platform based design.
- Appreciate high performance algorithms available for ASICs

REFERENCES:

1. M.J.S .Smith, "Application Specific Integrated Circuits, Addison -Wesley Longman Inc., 1997
2. S. Trimberger, Field Programmable Gate Array Technology, Edr, Kluwer Academic Publications, 1994.
3. John V.Oldfield, Richard C Dore, Field Programmable Gate Arrays, Wiley Publications 1995.
4. P.K.Chan & S. Mourad, Digital Design Using Field Programmable Gate Array, Prentice Hall, 1994.
5. Parag.K.Lala, Digital System Design using Programmable Logic Devices , BSP, 2003.
6. S. Brown, R. Francis, J. Rose, Z. Vransic, Field Programmable Gate Array, Kluwer Pubin, 1992.
7. J. Old Field, R.Dorf, Field Programmable Gate Arrays, John Wiley & Sons, Newyork, 1995.
8. Farzad Nekoogar and Faranak Nekoogar, From ASICs to SOCs: A Practical Approach, Prentice Hall PTR, 2003.
9. Wayne Wolf, FPGA-Based System Design, Prentice Hall PTR, 2004.
10. R. Rajsuman, System-on-a-Chip Design and Test. Santa Clara, CA: Artech House Publishers, 2000.
11. F. Nekoogar. Timing Verification of Application-Specific Integrated Circuits (ASICs). Prentice Hall PTR, 1999.

SEMESTER II

17271CRMP RESEARCH METHODOLOGY

3 0 0 3

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in 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.

SEMESTER III

17271H31P COMMUNICATION PROTOCOL ENGINEERING

4 0 0 4

UNIT I NETWORK REFERENCE MODEL 9

Communication model-software, subsystems, protocol, protocol development methods, Protocol engineering process, Layered architecture, Network services and Interfaces, Protocol functions, OSI model ,TCP/IP protocol suite

UNIT II PROTOCOL SPECIFICATIONS 9

Components of protocol, Specifications of Communication service, Protocol entity, Interface, Interactions,Multimedia protocol, Internet protocol, SDL, SDL based protocol- other protocol specification languages

UNIT III PROTOCOL VERIFICATION/VALIDATION 9

Protocol verification, Verification of a protocol using finite state machines, Protocol validation, protocol design errors, Protocol validation approaches, SDL based protocol verification and validation

UNIT IV PROTOCOL CONFORMANCE/PERFORMANCE TESTING 9

Conformance testing methodology and frame work, Conformance test architectures, Test sequence generation methods, Distributed architecture by local methods, Conformance testing with TTCN, systems with semi controllable interfaces - RIP,SDL based tools for conformance testing, SDL based conformance testing of MPLS Performance testing, SDL based performance testing of TCP and OSPF, Interoperability testing, SDL based interoperability testing of CSMA/CD and CSMA/CA protocol using Bridge, Scalability testing

UNIT V PROTOCOL SYNTHESIS AND IMPLEMENTATION 9

Protocol synthesis, Interactive synthesis algorithm, Automatic synthesis algorithm, Automatic synthesis of SDL from MSC, Protocol Re-synthesis; Requirements of protocol implementation, Object based approach to protocol implementation, Protocol compilers, Tool for protocol engineering

Tutorial :15 **Total:60 Periods**

BOOKS FOR REFERENCES:

1. Pallapa Venkataram and Sunilkumar S.Manvi, "Communication protocol Engineering", Eastern Economy edition, 2004
2. Richard Lai and Jirachiefpattana, "Communication Protocol Specification and Verification", Kluwer Publishers, Boston, 1998.
3. Tarnay, K., "Protocol Specification and Testing", Plenum, New York, 1991.
4. Mohamed G. Gouda, "Elements of Network Protocol Design", John Wiley & Sons, Inc. New York,USA, 1998
5. V.Ahuja, "Design and Analysis of Computer Communication networks", McGraw-Hill, London,1982.
6. G.J.Holtzmann, "Design and validation of Computer protocols", Prentice Hall, New York, 1991.

SEMESTER III

17271H32P **ADVANCED RADIATION SYSTEMS**

4 0 0 4

UNIT I CONCEPTS OF RADIATION 9

Retarded vector potentials – Heuristic approach and Maxwell's equation approach. Electric vector potential F for a magnetic current source M. Duality theorem. The Lorentz gauge condition. Vector potential in Phasor form. Fields radiated by an alternating current element and half wave dipole. Total power radiated and radiation resistance of alternating current element and half wave dipole. Power radiated in the far field. Linear, Elliptical and circular polarization. Development of the Poincare sphere.

UNIT II ANTENNA ARRAYS 9

N element linear arrays – uniform amplitude and spacing- Phased arrays- Directivity of Broadside and End fire arrays. Three dimensional characteristics - Pattern multiplication- Binomial arrays and Dolph-Tchebycheff arrays. Circular array. Mutual coupling in arrays, multidimensional arrays- phased arrays and array feeding techniques.

UNIT III ANTENNA SYNTHESIS 9

Synthesis problem-Line source based beam synthesis methods (Fourier transform and Woodward-Lawson sampling method – Linear array shaped beam synthesis method – Low side lobe, narrow main beam synthesis methods - discretization of continuous sources. Schelkunoff polynomial method

UNIT IV APERTURE ANTENNAS 9

Radiation from apertures - Huygens Principle. Rectangular apertures- techniques for evaluating gain,Circular apertures and their design considerations- Babinets principle Fraunhoffer and Fresnel diffraction.Complimentary screens and slot antennas. Slot and dipoles as dual antennas. Fourier transform in aperture antenna theory.

UNIT V HORN, MICROSTRIP, REFLECTOR ANTENNAS. 9

E and H plane sectoral Horns. Pyramidal horns. Conical and corrugated Horns. Multimode horns. Phasecenter.Microstrip antennas – feeding methods. Rectangular patch- Transmission line model – Circular patchParabolic Reflector antennas – Prime focus and cassegrain reflectors. Equivalent focal length of Cassegrain antennas. Spillover and taper efficiencies. Optimum illumination.

Tutorial :15 Total:60 Periods

BOOKS FOR REFERENCES:

1. Balanis, C.A., “Antenna Theory” Wiley,2003
2. Warren L. Stutzman and Gary A. Thiele,“ Antenna theory and design”John Wiley and sons 1998
3. Jordan, E.C., “ Electromagnetic waves and Radiating systems”. PHI 2003
4. Krauss, J.D., “ Radio Astronomy” McGraw-Hill 1966, for the last unit (reprints available)
5. Krauss, J.D.,, Fleisch,D.A., “Electromagnetics” McGraw-Hill,1999

SEMESTER III
ELECTIVE - II

17271E33AP INTERNETWORKING AND MULTIMEDIA

4 0 0 4

UNIT I MULTIMEDIA NETWORKING

Digital sound, video and graphics, basic multimedia networking, multimedia characteristics, evolution of Internet services model, network requirements for audio/ video transform, multimedia coding and compression for text, image, audio and video.

UNIT II BROADBAND NETWORK TECHNOLOGY

Broadband services, ATM and IP, IPV6, High speed switching, resource reservation, Buffer management, traffic shaping, caching, scheduling, and policing, throughput, delay and jitter performance. Storage and media services, voice and video over IP, MPEG-2 over ATM/IP, indexing synchronization of requests, recording and remote control.

UNIT III RELIABLE TRANSPORT PROTOCOL AND APPLICATIONS

Multicast over shared media network, multicast routing and addressing, scaling multicast and NBMA networks, Reliable transport protocols, TCP adaptation algorithm, RTP, RTCP. MIME, Peer- to-Peer computing, shared application, video conferencing, centralized and distributed conference control,distributed virtual reality, light weight session philosophy.

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS

Objective of MPEG- 7 standard, Functionalities and systems of MPEG-7, MPEG-21 Multimedia Framework Architecture, - Content representation, Content Management and usage, Intellectual property management, Audio visual system- H322: Guaranteed QOS LAN systems; MPEG_4 video Transport across internet.

UNIT V MULTIMEDIA COMMUNICATION ACROSS NETWORKS

Packet Audio/video in the network environment, video transport across Generic networks- Layered video coding, error Resilient video coding techniques, Scalable Rate control, Streaming video across Internet,Multimedia transport across ATM networks and IP network, Multimedia across wireless networks.

BOOKS FOR REFERENCES:

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd.Singapore, 1998.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 1995.
3. Tay Vaughan, Multimedia - Making it to work, 4ed, Tata McGraw Hill , NewDelhi, 2000.
4. K.R.Rao, Zoran S. Bojkovic and Dragorad A. Milovanovic, Multimedia Communication systems, PHI,

SEMESTER III
ELECTIVE – II

17271E33BP **DIGITAL IMAGE PROCESSING**

4 0 0 4

UNIT I DIGITAL IMAGE FUNDAMENTALS

Elements of digital image processing systems - Elements of visual perception - Psycho visual model - Brightness - Contrast - Hue - Saturation - Mach band effect - Color image fundamentals – RGBHSI models - Image sampling - Quantization - Dither - Two-dimensional mathematical preliminaries.

UNIT II IMAGE TRANSFORMS

1D DFT - 2D transforms - DFT - DCT - Discrete Sine - Walsh - Hadamard - Slant - Haar - KLT SVD - Wavelet Transform.

UNIT III ENHANCEMENT AND RESTORATION

Histogram modification and specification techniques - Noise distributions - Spatial averaging - Directional Smoothing – Median - Geometric mean - Harmonic mean - Contraharmonic and Yp mean filters - Homomorphic filtering - Color image enhancement - Image Restoration – Degradation model - Unconstrained and Constrained restoration - Inverse filtering - Removal of blur caused by uniform linear motion - Wiener filtering - Geometric transformations - Spatial transformations -Gray Level interpolation.

UNIT IV IMAGE SEGMENTATION AND RECOGNITION

Edge detection - Image segmentation by region growing - Region splitting and merging – Edge linking - Image Recognition - Patterns and pattern classes - Matching by minimum distance classifier - Matching by correlation - Back Propagation Neural Network - Neural Network applications in Image Processing.

UNIT V IMAGE COMPRESSION **9**

Need for data compression - Huffman - Run Length Encoding - Shift codes - Arithmetic coding - Vector Quantization - Block Truncation Coding - Transform Coding - DCT and Wavelet - JPEG - MPEG – Standards - Concepts of Context based Compression.

BOOKS FOR REFERENCES:

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Second Edition, Pearson Education Inc., 2004.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002.
3. David Salomon , "Data Compression The Complete Reference", 2nd Edition, Springer Verlag , New York Inc., 2001.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, "Digital Image Processing usingMATLAB", Pearson Education, Inc., 2004.
5. William K. Pratt, "Digital Image Processing", John Wiley, NewYork, 2002.
4. Milman Sonka, Vaclav Hlavac, Roger Boyle, "Image Processing Analysis and Machine Vision", 2nd edition, Brooks/Cole, Vikas Publishing House, 1999.

SEMESTER III
ELECTIVE – II

17271E33CP LASER COMMUNICATION
4 0 0 4

UNIT I INTRODUCTION TO LASER COMMUNICATIONS 9

Atmospheric low loss windows, optical sources and detectors for these windows, Characteristics of source and detectors. Optical transmitting and receiving antennas.

UNIT II SYSTEM DESIGN 9

Link equation, Transmitter terminal, Antenna design, Antenna gain, Beam width, C/N, Optical detectors, Optical modulation formats, Deriving error statistics, Signal requirements for acquisition and tracking, Fundamentals of system design.

UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9

Performance and Geometries, output wavelength control, Semiconductor laser lifetime, Direct and indirect modulation techniques and radiation effects.

UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9

Direct detection, coherent detection and demodulation. Gimbals in transceiver design, Receiver options and optics; Lasers; antennas / Telescope, Internal optical systems, Transmitter analysis.

UNIT V LASER BEAM POINTING CONTROL 9

Acquisition and Tracking systems, System description, Acquisition methodology, racking and pointing control system, RF cross link system design, link equation.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Morris Katzman, "Laser Satellite Communications", Prentice Hall Inc, New York, 1991.

2. J. Franz and V.K.Jain, “Optical Communication Systems”, Narosa Publication, New Delhi, 1994.

SEMESTER III
ELECTIVE – II

17271E33DP MEMS AND NEMS **L T P C 3 0 0 3**

OBJECTIVES:

- To introducing the concepts of microelectromechanical devices.
- To know the fabrication process of Microsystems.
- To know the design concepts of micro sensors and micro actuators.
- To introducing concepts of quantum mechanics and nano systems.

UNIT I OVERVIEW AND INTRODUCTION 9

New trends in Engineering and Science: Micro and Nanoscale systems Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Microelectromechanical systems, devices and structures Definitions, Materials for MEMS: Silicon, silicon compounds, polymers, metals

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Microsystem fabrication processes: Photolithography, Ion Implantation, Diffusion, Oxidation.Thin film depositions: LPCVD, Sputtering, Evaporation, Electroplating; Etching techniques: Dry and wet etching, electrochemical etching; Micromachining: Bulk Micromachining, Surface Micromachining, High Aspect-Ratio (LIGA and LIGA-like) Technology; Packaging: Microsystems packaging, Essential packaging technologies, Selection of packaging materials

UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, resonant sensor, Vibratory gyroscope, Capacitive and Piezo Resistive Pressure sensors- engineering mechanics behind these Microsensors. Case study: Piezo-resistive pressure sensor

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 (Parallel plate, Torsion bar, Comb drive actuators), Micromechanical Motors and pumps. Case study: Comb drive actuators

UNIT V NANOSYSTEMS AND QUANTUM MECHANICS 9

Atomic Structures and Quantum Mechanics, Molecular and Nanostructure Dynamics: Shrodinger Equation and Wavefunction Theory, Density Functional Theory, Nanostructures and Molecular Dynamics, Electromagnetic Fields and their quantization, Molecular Wires and Molecular Circuits.

TOTAL:45 PERIODS

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

SEMESTER IV

17271H41P WIRELESS SENSOR NETWORKS

4 0 0 4

UNIT I OVERVIEW OF WIRELESS SENSOR NETWORKS 8

Challenges for Wireless Sensor Networks, Enabling Technologies For Wireless Sensor Networks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT III NETWORKING SENSORS 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC , The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT V SENSOR NETWORK PLATFORMS AND TOOLS 9

Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

TOTAL= 45 PERIODS

BOOKS FOR REFERENCES:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

SEMESTER IV

17271H42P **FIBER OPTIC NETWORKING**

4 0 0 4

UNIT I OPTICAL NETWORKING COMPONENTS: 9

First- and second-generation optical networks, Components: couplers, isolators, circulators, multiplexers,filters, amplifiers, switches, and wavelength converters.

UNIT II SONET AND SDH NETWORKS: 9

Integration of TDM signals, Layers, Framing, Transport overhead, Alarms, Multiplexing, Network elements, Topologies, Protection architectures, Ring architectures, Network Management.

UNIT III BROADCAST – AND- SELECT NETWORKS: 9

Topologies, Single-hop, Multihop, and Shufflenet multihop networks, Media-Access control protocols,Test beds.

UNIT IV WAVELENGTH-ROUTING NETWORKS: 9

Node designs, Issues in Network design and operation, Optical layer cost Tradeoffs, Routing and Wavelength assignment, Wavelength routing test beds.

UNIT V HIGH CAPACITY NETWORKS: 9

SDM, TDM, and WDM approaches, Application areas, Optical TDM Networks: Multiplexing and demultiplexing, Synchronization, Broadcast networks, Switch-based networks, OTDM test beds.

Total:45

BOOKS FOR REFERENCES:

1. Rajiv Ramaswami and Kumar Sivarajan, Optical Networks: A practical perspective, Morgan Kaufmann, 2nd edition, 2001.
2. Vivek Alwayn, Optical Network Design and Implementation, Pearson Education, 2004.
3. Hussein T.Mouftab and Pin-Han Ho, Optical Networks: Architecture and Survivability, Kluwer Academic Publishers, 2002.
4. Biswanath Mukherjee, Optical Communication Networks, McGraw Hill, 1997

SEMESTER IV
ELECTIVE – III

17271E43AP DIGITAL COMMUNICATION RECEIVERS
4 0 0 4

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES
Base band and band pass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL
Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS
Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading,diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES
Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

UNIT V ADAPTIVE EQUALIZATION
Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

BOOKS FOR REFERENCES:

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, "Digital Communication Receivers", Vol I& II, John Wiley, New York, 1997
2. John. G. Proakis, "Digital Communication", 4th ed., McGraw Hill, New York, 2001
3. E.A. Lee and D.G. Messerschmitt, "Digital Communication", 2nd edition, Allied Publishers, New Delhi, 1994
4. Simon Marvin, "Digital Communication Over Fading channel; An unified approach to performance Analysis", John Wiley, New York, 2000
5. Bernard Sklar, "Digital Communication Fundamentals and Applications, Prentice Hall, 1998

SEMESTER IV
ELECTIVE – III

17271E43BP SOFT COMPUTING
4 0 0 4

UNIT I ARTIFICIAL NEURAL NETWORKS

Basic concepts-single layer perceptron-Multi layer perceptron-Adaline-Madaline-Learning rules-Supervised learning-Back propagation networks-Training algorithm, Practical difficulties, Advanced algorithms-Adaptive network- Radial basis network-modular network-Applications

UNIT II UNSUPERVISED NETWORKS

Introduction- unsupervised learning -Competitive learning networks-Kohonen self organising networks-Learning vector quantisation - Hebbian learning - Hopfield network-Content addressable nature, Binary Hopfield network, Continuous Hopfield network Traveling Salesperson problem - Adaptive resonance theory –Bidirectional Associative Memory-Principle component Analysis

UNIT III FUZZY SYSTEMS

Fuzzy sets-Fuzzy rules: Extension principle, Fuzzy relation- fuzzy reasoning – fuzzy inference systems:Mamdani model, Sugeno model. Tsukamoto model -Fuzzy decision making- Multiobjective Decision Making,-Fuzzy classification-Fuzzy control methods -Application

UNIT IV NEURO-FUZZY MODELLING

Adaptive Neuro Fuzzy based inference systems – classification and regression trees: decision tress, Cart algorithm – Data clustering algorithms: K means clustering, Fuzzy C means clustering, Mountain clustering, Subtractive clustering – rule base structure identification – Neuro fuzzy control: Feedback Control Systems, Expert Control, Inverse Learning, Specialized Learning, Back propagation through Real –Time Recurrent Learning.

UNIT V GENETIC ALGORITHM

Fundamentals of genetic algorithm-Mathematical foundations-Genetic modeling-Survival of the fittestcrossover-Inversion and Deletion-mutation-reproduction-Generational cycle-rank method-rank space method- Other derivative free optimization-simulated annealing, Random search, Downhill simplex search-Application

BOOKS FOR REFERENCES:

1. Jang J.S.R.,Sun C.T and Mizutani E – “Neuro Fuzzy and Soft computing”, Pearson education(Singapore) 2004
2. David E.Goldberg : “Genetic Algorithms in Search, Optimization, and Machine Learning”, PearsonEducation, Asia,1996
3. Laurene Fauseett:”Fundamentals of Neural Networks”, Prentice Hall India, New Delhi,1994.
4. Timothy J.Ross:”Fuzzy Logic Engineering Applications”, McGrawHill, ewYork,1997.
5. S.Rajasekaran and G.A.Vijayalakshmi Pai “Neural networks,Fuzzy logics,and Genetic algorithms”,Prentice Hall of India,2003
6. George J.Klir and Bo Yuan,”Fuzzy Sets and Fuzzy Logic”,Prentice Hall Inc., New Jersey,1995

SEMESTER IV
ELECTIVE – III

17271E43CP COMMUNICATION NETWORK SECURITY

4 0 0 4

UNIT I SYMMETRIC CIPHERS

Introduction – Services, Mechanisms and Attacks, OSI security Architecture, Model for network Security;Classical Encryption Techniques- Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Product ciphers , Data Encryption Standard- Block Cipher Principles, Strength of DES,Differential and Linear Crypt Analysis, Block Cipher Design Principles, BlockCipher Modes of peration,Stegnography;

UNIT II ADVANCED ENCRYPTION STANDARD AND STREAM CIPHERS
Evaluation Criteria for AES, AES Cipher; Contemporary Symmetric Ciphers- Triple DES, Blowfish, RC5-Characteristics of Advanced Symmetric Block Ciphers, Stream ciphers based on LFSRs,RC4 Stream Cipher; Random Number Generation. Traffic Confidentiality, Key Distribution,

UNIT III PUBLIC-KEY ENCRYPTION AND HASH FUNCTIONS
Public Key Cryptography and Key Management- RSA Algorithm and other public key cryptosystems- ,Diffie-Hellman Key Exchange, Elliptic Curve arithmetic, Elliptic Curve Cryptography; Message Authentication and Hash Functions- Authentication Requirements, - MD5 Message Digest Algorithm;Secure Hash Algorithm, RIPEMD 160, HMAC; Digital Signatures and Authentication Protocols- Digital
Signature Standards.

UNIT IV NETWORK SECURITY PRACTICE
Authentication Applications- Kerberos, X.509 Authentication Service; Electronic Mail Security- Pretty Good Privacy, S/MIME; IP Security- overview and Architecture, Authentication Header, Encapsulating Security Payload, Combining Security Associations; Web Security- Web Security Considerations, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.

UNIT V SYSTEM SECURITY
Intruders- Intruder Detection, Password Management; Malicious Software- Virus and Related Threats,Virus Counter Measures; Firewalls- Firewall Design Principles, Trusted Systems.

BOOKS FOR REFERENCES:

1. William Stallings, “Cryptography and Network Security”, 3rd Edition. Prentice Hall of India, New Delhi, 2004
2. William Stallings, “Network Security Essentials”, 2nd Edition. Prentice Hall of India, New Delhi, 2004
3. Charlie Kaufman, “Network Security: Private Communication in Public World”, 2nd Edition. PrenticeHall of India, New Delhi, 2004

SEMESTER IV

ELECTIVE –III

17271E43DP RADAR SIGNALPROCESSING L T P C 3 0 0 3

OBJECTIVES:

- To understand the Radar Signal acquisition and sampling in multiple domains
- To provide clear instruction in radar DSP basics
- To equip the skills needed in both design and analysis of common radar algorithms
- To understand the basics of synthetic aperture imaging and adaptive array processing
- To illustrate how theoretical results are derived and applied in practice

UNIT I INTRODUCTION TO RADAR SYSTEMS 9

History and application of radar, basic radar function, elements of pulsed radar, review of signal processing concepts and operations, A preview of basic radar signal processing, radar system components, advanced radar signal processing

UNIT II SIGNAL MODELS 9

Components of a radar signal, amplitude models, types of clutters, noise model and signal-to- noise ratio, jamming, frequency models: the doppler shift, spatial models, spectral model

UNIT III SAMPLING AND QUANTIZATION OF PULSED RADAR SIGNALS 9

Domains and criteria for sampling radar signals, Sampling in the fast time dimension,Sampling in slow time: selecting the pulse repetition interval, sampling the doppler spectrum,Sampling in the spatial and angle dimension, Quantization, I/Q Imbalance and Digital I/Q

UNIT IV RADAR WAVEFORMS 9

Introduction, The waveform matched filter, Matched filtering of moving targets, The ambiguity function, The pulse burst waveform, frequency-modulated pulse compression waveforms, Range sidelobe control for FM waveforms, the stepped frequency waveform, Phase-modulated pulse compression waveforms, COSTAS Frequency Codes.

UNIT V DOPPLER PROCESSING 9

Alternate forms of the Doppler spectrum, Moving target indication (MTI), Pulse Doppler processing, dwell-to-dwell stagger, Pulse pair processing, additional Doppler processing issues, clutter mapping and the moving target detector, MTI for moving platforms: adaptive displaced phase center antenna processing

TOTAL : 45 PERIODS

COURSE OUTCOMES:

- Know how a radar is built and understand the principles of behavior.
- Have a basic understanding of how radar signals propagate through a medium, and the mechanisms for signal reflection from the target and unwanted reflections (“clutter”).
- Understand the basic principles of signal processing done in a radar.
- Be able to estimate the performance of a radar based on parameters provided, for example at what distance the radar will be able to detect targets of a given size.
- Be able to assess what type of radar is suitable for which task (choice of waveforms, frequency bands, etc..).
- Be able to use numerical tools to calculate radar performance and to simulate the signal processing in a radar.

REFERENCES:

1. Fundamentals of Radar Signal Processing, Mark A. Richards McGraw-Hill, New York, 2005
2. Principles of Radar and Sonar Signal Processing, Francois Le Chevalier, Artech House
3. Radar systems, Peak Detection and Tracking, Michael O Kolawole ,2010,Elseveir
4. Introduction To Radar Systems 3/E, Skolnik, McGraw Hill.
5. Radar Principles, Peyton Z. Peebles, 2009 Wiley India

Radar Design Principles-Signal Processing and the environment, Fred E. Nathanson, PHI

4. Zhijun Zhang" Antenna Design for Mobile Devices" 1st Edition, John Wiley & Sons (Asia) Ltd, Newyork, 2011.

SEMESTER V
ELECTIVE - IV

17271E51AP SOFTWARE DEFINED RADIO

4 0 0 4

UNIT I: Introduction to SDR **9**

The Need for Software Radios-Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio. Radio frequency implementation issues-The Purpose of the RF Front-End. Dynamic Range: The Principal Challenge of Receiver Design. RF Receiver Front-End Topologies. Enhanced Flexibility of the RF Chain with Software Radios. Importance of the Components -Transmitter Architectures and their Issues. Noise and Distortion in the RF Chain. ADC and DAC Distortion.

UNIT II : Direct Digital Synthesis **9**

Introduction. Comparison of Direct Digital Synthesis with Analog Signal Synthesis. Approaches to Direct Digital Synthesis. Analysis of Spurious Signals. Spurious Components due to Periodic Jitter. Band pass Signal Generation. Performance of Direct Digital Synthesis Systems. Hybrid DDS-PLL Systems. Applications of direct Digital Synthesis. Generation of Random Sequences. ROM Compression Techniques.

UNIT III Signal Processor and Multi Rate Processing Techniques **9**

Introduction. Sample Rate Conversion Principles. Polyshase Filters. Digital Filter Banks. Timing Recovery in Digital Receivers Using Multirate Digital Filters.

DSP Processors; Field Programmable Gate Arrays; Trade-Offs in Using DSPs, FPGAs, and ASICs; Power Management Issues; Using a Combination of DSPs, FPGAs, and ASICs.

UNIT IV: Smart Antennas **9**

Vector channel modeling; Benefits of smart antennas; Structures for Beam forming Systems; Smart Antenna Algorithms. Diversity and Space-Time Adaptive Signal Processing; Algorithms for Transmit STAP; Hardware Implementation of Smart Antennas; Array Calibration.

UNIT V: Applications –Wireless Aspects of Tele-Health Care

The application of advanced telecommunication , the special requirements especially related to reliability, privacy and trust, Regulatory and safety aspects of tele-health care, Cognitive radio and flexible spectrum usage for tele-healthcare, Cooperative Communications for Tele-health. Case studies: JTRS radio system ,Software defined base stations.

BOOKS FOR REFERENCES:

1. Jeffrey H. Reed -Software Radio: A Modern Approach to Radio Engineering Publisher: Prentice Hall PTR; May 2002 ISBN: 0170811580.
2. Wireless Communications: Principles and Practice, 2nd ed,by Rappaport, Prentice-Hall 2002. ISBN 0-13-042232-0.
3. Wireless Application Development, by Skelton, Thomson, 2003, ISBN 0-619-15931-6

17271E51BP SATELLITE COMMUNICATION

4 0 0 4

UNIT I ORBITAL MECHANICS
Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations,Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitudecontrol; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT II SPACECRAFT SUB SYSTEMS AND EARTH STATION
Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems,Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III SPACE LINKS
The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits,Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS
Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS).Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures.
Hybrid satellite-terrestrial networks

UNIT V SERVICES AND APPLICATIONS
Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS,INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Video conferencing and Internet connectivity

BOOKS FOR REFERENCES:

1. Dennis Roddy, “Satellite Communications”, 3rd Edition, Mc Graw Hill International Editions, 2001
2. Bruce R.Elbert, “Introduction to Satellite Communication” , Artech House Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, “Satellite Communications”, 2nd Edition, Wiley, John& Sons, 2002
4. Wilbur L.Pritchard, Hendri G.Suyderhood, Robert A.Nelson, “Satellite Communication Systems Engineering”, 2nd Edition, Prentice Hall, New Jersey, 1993
5. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.1790

17271E51CP CDMA SYSTEMS

4 0 0 4

UNIT I BASIC CONCEPTS OF CDMA 9

Spread spectrum communication techniques (DS-CDMA, FH-CDMA), Synchronization in CDMA system, Detection and False alarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

UNIT II IS-95 CDMA TECHNIQUES 9

Spreading Codes , Power control, Handover techniques, Physical and logical channels and processing (Forward and reverse links)

UNIT III WCDMA / CDMA 2000 9

Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation & demodulation process , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS 9

Multicarrier CDMA, System design , Performance parameters – BER lower bound, Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA 9

Prime Codes and it’s properties, Generalized and Extended Prime Codes, Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multiwavelength Optical CDMA networks.

TOTAL : 45 PERIODS

BOOKS FOR REFERENCES:

1. John G.Proakis, “Digital Communications”, McGraw Hill International Ltd, 4th ed., Singapore, 2000.
2. Andrew J. Viterbi, “ CDMA: Principles of Spread Spectrum Communication, Addison- Wesley, 1sted. , 1995.
3. Kaveth Pahlavan,. K. Prashanth Krishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, “IS –95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation”, Pearson Education , 2st ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, ” OFDM for Wireless Multimedia Communication” , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, “Wireless Communication”, Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, “GSM CDMA One and 3G Systems”, Wiley India, 2004.
8. Guu-Chang Yang, “Prime Codes with Application to Optical and Wireless Networks”, Artech House, Inc., 2002.

SEMESTER V
ELECTIVE IV

17271E51DP SPEECH PROCESSING AND SYNTHESIS L T P C 3 0 0 3

OBJECTIVES:

- To understand the mathematical foundations needed for speech processing
- To understand the basic concepts and algorithms of speech processing and synthesis
- To familiarize the students with the various speech signal representation, coding and recognition techniques
- To appreciate the use of speech processing in current technologies and to expose the students to real– world applications of speech processing

UNIT I FUNDAMENTALS OF SPEECH PROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables and Words – Syntax and Semantics – Probability, Statistics and Information Theory – Probability Theory – Estimation Theory – Significance Testing – Information Theory.

UNIT II SPEECH SIGNAL REPRESENTATIONS AND CODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time Fourier Analysis – Acoustic Model of Speech Production – Linear Predictive Coding – Cepstral Processing – Formant Frequencies – The Role of Pitch – Speech Coding – LPC Coder.

UNITIII SPEECH RECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – Practical Issues – Limitations. Acoustic Modeling – Variability in the Speech Signal – Extracting Features – Phonetic Modeling – Adaptive Techniques – Confidence Measures – Other Techniques.

UNITIV TEXT ANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis – Homograph Disambiguation – Morphological Analysis – Letter-to-sound Conversion – Prosody – Generation schematic – Speaking Style – Symbolic Prosody – Duration Assignment – Pitch Generation

UNIT V SPEECH SYNTHESIS 9

Attributes – Formant Speech Synthesis – Concatenative Speech Synthesis – Prosodic Modification of Speech – Source-filter Models for Prosody Modification – Evaluation of TTS Systems.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the various temporal, spectral and cepstral features required for identifying speech units – phoneme, syllable and word
- Determine and apply Mel-frequency cepstral coefficients for processing all types of signals
- Justify the use of formant and concatenative approaches to speech synthesis
- Identify the apt approach of speech synthesis depending on the language to be processed
- Determine the various encoding techniques for representing speech.

REFERENCES:

1. Xuedong Huang, Alex Acero, Hsiao-Wuen Hon, “Spoken Language Processing – A guide to Theory, Algorithm and System Development”, Prentice Hall PTR, 2001.
2. Thomas F.Quatieri, “Discrete-Time Speech Signal Processing”, Pearson Education, 2002.
3. Lawrence Rabiner and Biing-Hwang Juang, “Fundamentals of Speech Recognition”, Prentice Hall Signal Processing Series, 1993.
4. Sadaoki Furui, “Digital Speech Processing: Synthesis, and Recognition, Second Edition, (Signal Processing and Communications)”, Marcel Dekker, 2000.
5. Joseph Mariani, “Language and Speech Processing”, Wiley, 2009.

SEMESTER V
ELECTIVE –V

17271E52AP WAVELETS AND MULTIRESOLUTION PROCESSING

4 0 0 4

UNIT I INTRODUCTION

Vector Spaces - properties - dot product - basis - dimension, orthogonality and orthonormality - relationship between vectors and signals - Signal spaces - concept of Convergence – Generalised Fourier Expansion.

UNIT II MULTI RESOLUTION ANALYSIS

Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRAWavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks

UNIT III CONTINUOUS WAVELET TRANSFORM

Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet,Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time -scale plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORM

Filter Bank and sub band coding principles - Wavelet Filters - Inverse DWT computation by Filter banks -Basic Properties of Filter coefficients - Choice of wavelet function coefficients - Derivations of Daubechies Wavelets - Multi-band Wavelet transforms. Introduction to lifting Scheme

UNIT V APPLICATIONS

Signal Compression – Image Compression techniques: EZW-SPHIT Coding - Image denoising techniques:Noise estimation - Shrinkage rules -. Shrinkage Functions - Edge detection and object Isolation, Image Fusion, and Object Detection.

BOOKS FOR REFERENCES:

1. Rao .R.M and A.S.Bopardikar, "Wavelet Transforms: Introduction to theory and Applications”,Pearson Education Asia Pte. Ltd., 2000.
2. Strang G, Nguyen T, "Wavelets and Filter Banks," Wellesley Cambridge Press, 1996
3. Vetterli M, Kovacevic J., "Wavelets and Sub-band Coding," Prentice Hall, 1995
4. Mallat S., "Wavelet tour of Signal Processing”, Academic Press, 1996

5. David C. Lay., “Linear Algebra and its applications” Pearson education, 2007.(Unit I only)

SEMESTER V
ELECTIVE - V

17271E52BP HIGH PERFORMANCE COMMUNICATION NETWORKS

4 0 0 4

UNIT I PACKET SWITCHED NETWORKS
OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI,DQDB, SMDS: Internetworking with SMDS

UNIT II ISDN AND BROADBAND ISDN
ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY
ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer,management and control, ATM switching and transmission.
Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM,Frame relay via ATM.

UNIT IV ADVANCED NETWORK ARCHITECTURE
IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V BLUE TOOTH TECHNOLOGY
The Blue tooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller,Audio, The Link Manager, The Host controller interface; The Blue tooth module-Protocol stack Part I:Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

BOOKS FOR REFERENCES:

1. William Stallings,”ISDN and Broadband ISDN with Frame Relay and ATM”, 4th edition, Pearsoneducation Asia, 2002.
2. Leon Gracia, Widjaja, “Communication networks ", Tata McGraw-Hill, New Delhi, 2000.
3. Jennifer Bray and Charles F.Sturman,”Blue Tooth” Pearson education Asia, 2001.
4. Sumit Kasera, Pankaj Sethi, “ATM Networks ", Tata McGraw-Hill, New Delhi, 2000.
5. Rainer Handel, Manfred N.Huber and Stefan Schroder ,”ATM Networks”,3rd edition, Pearsoneducation asia,2002.
6. Jean Walrand and Pravin varaiya ,”High Performance Communication networks”,2nd edition,Harcourt and Morgan Kauffman,London,2000.
7. William Stallings,”High-speed Networks and Internets”, 2nd edition, Pearson education Asia, 2003.

SEMESTER V
ELECTIVE - V

17271E52CP ADVANCED MICROPROCESSORS AND MICRO CONTROLLERS
4 0 0 4

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline –pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipe lining – Branch prediction – The instruction and caches –Floating point unit –protected mode operation – Segmentation – paging – Protection – multitasking –Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing -Instruction types – Addressing modes – Processor flags – Instruction set -programming the Pentium processor.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE :ARM 9

The ARM architecture – ARM assembly language program – ARM organization and implementation –The ARM instruction set - The thumb instruction set – ARM CPU cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – Parallel I/O ports – Flags – Real time clock – Programmable timer – pulse accumulator – serial communication interface – A/D converter – hardware expansion – Assembly language Programming

UNIT V PIC MICRO CONTROLLER 9

CPU architecture – Instruction set - Interrupts – Timers – I/O port expansion –I2C bus for peripheral chip access – A/D converter – UART

BOOKS FOR REFERENCES:

1. Daniel Tabak, “Advanced Microprocessors” McGraw Hill.Inc., 1995
2. James L. Antonakos, “The Pentium Microprocessor”, Pearson Education, 1997.
3. Steve Furber, “ARM System –On –Chip architecture”, Addison Wesley, 2000.
4. Gene .H.Miller. “Micro Computer Engineering”, Pearson Education, 2003.
5. John .B.Peatman, “Design with PIC Microcontroller”, Prentice hall, 1997.
6. James L.Antonakos, “An Introduction to the Intel family of Microprocessors”, PearsonEducation 1999.
7. Barry.B.Breg, “The Intel Microprocessors Architecture , Programming and Interfacing”, PHI, 2002.
8. Valvano, “Embedded Microcomputer Systems’, Thomson Asia PVT LTD first reprint 2001 Readings.

Web links: www.ocw.nit.edu,www.arm.com,

SEMESTER V
ELECTIVE - V

17271E52DP RECONFIGURABLE COMPUTING

OBJECTIVES

- To understand the need for reconfigurable computing
- To expose the students to various device architectures

- To examine the various reconfigurable computing systems
- To understand the different types of compute models for programming reconfigurable architectures
- To expose the students to HDL programming and familiarize with the development environment
- To expose the students to the various placement and routing protocols
- To develop applications with FPGAs

UNIT I DEVICE ARCHITECTURE 9

General Purpose Computing Vs Reconfigurable Computing – Simple Programmable Logic Devices – Complex Programmable Logic Devices – FPGAs – Device Architecture - Case Studies.

UNIT II RECONFIGURABLE COMPUTING ARCHITECTURES AND SYSTEMS 9

Reconfigurable Processing Fabric Architectures – RPF Integration into Traditional Computing Systems – Reconfigurable Computing Systems – Case Studies – Reconfiguration Management.

UNIT III PROGRAMMING RECONFIGURABLE SYSTEMS 9

Compute Models - Programming FPGA Applications in HDL – Compiling C for Spatial Computing

– Operating System Support for Reconfigurable Computing.

UNIT IV MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

The Design Flow - Technology Mapping – FPGA Placement and Routing – Configuration Bitstream Generation – Case Studies with Appropriate Tools.

UNIT V APPLICATION DEVELOPMENT WITH FPGAS 9

Case Studies of FPGA Applications – System on a Programmable Chip (SoPC) Designs.

TOTAL: 45 PERIODS

OUTCOMES:

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

1. Identify the need for reconfigurable architectures
2. Discuss the architecture of FPGAs
3. Point out the salient features of different reconfigurable architectures
4. Build basic modules using any HDL
5. Develop applications using any HDL and appropriate tools
6. Design and build an SoPC for a particular application

REFERENCES:

1. Maya B. Gokhale and Paul S. Graham, “Reconfigurable Computing: Accelerating Computation with Field-Programmable Gate Arrays”, Springer, 2005.
2. Scott Hauck and Andre Dehon (Eds.), “Reconfigurable Computing – The Theory and Practice of FPGA-Based Computation”, Elsevier / Morgan Kaufmann, 2008.
3. Christophe Bobda, “Introduction to Reconfigurable Computing – Architectures, Algorithms and Applications”, Springer, 2010.

SEMESTER V
ELECTIVE –VI

17271E53AP SIMULATION OF COMMUNICATION NETWORKS 4 0 0 4

UNIT I MODELLING OF COMMUNICATION SYSTEM 9

Model of speech and picture signals, Pseudo noise sequences, Non-linear sequences, Analog channel model, Noise and fading, Digital channel model-Gilbert model of bursty channels, HF, Troposcatter and satellite channels, Switched telephone channels, Analog and Digital communication system models, Light wave system models.

UNIT II SIMULATION OF RANDOM VARIABLES AND RANDOM PROCESS 9

Univariate and multivariate models, Transformation of random variables, Bounds and approximation,Random process models-Markov and ARMA Sequences, Sampling rate for simulation, Computer generation and testing of random numbers

UNIT III ESTIMATION OF PERFORMANCE MEASURES 9

Quality of an estimator, estimator for SNR, Probability density functions of analog communication system,BER of digital communication systems, Monte Carlo method and Importance of sampling method,estimation of power spectral density

UNIT IV COMMUNICATION NETWORKS 9

Queuing models, M/M/I and M/M/I/N queues, Little formula, Burke's theorem ,M/G/I queue, Embedded Markov chain analysis of TDM systems, Polling, Random access systems

UNIT V NETWORK OF QUEUES 9

Queues in tandem, store and forward communication networks, capacity allocation, Congestion and flow chart, Routing model, Network layout and Reliability

BOOKS FOR REFERENCES:

1. M.C.Jeruchim,Philip Balaban and K.Sam Shanmugan, "Simulation of communication systems",Springer, 2nd Edition, 2002.
2. A.M.Law and W.David Kelton, "Simulation Modelling and analysis", 3rd Edition, Mc Graw Hill Inc.,1999.
3. J.F.Hayes, “Modeling and Analysis of Computer Communication networks (Applications of Communication Theory)”, Plenum Press, 1984.
4. Jerry Banks and John S.Carson and Barry L. Nelson, “Discrete-Event System Simulation”, 4th Edition,Prentice Hall Inc., 2004.

SEMESTER V
ELECTIVE -VI

17271E53BP 4 0 0 4

MEDICAL IMAGING

UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS 8

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II COMPUTER AIDED TOMOGRAPHY 10

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III RADIO ISOTOPIC IMAGING 9

Radiation detectors, Radio isotopic imaging equipments, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV ULTRASONIC SYSTEMS 9

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V MAGNETIC RESONANCE IMAGING 9

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

TOTAL:45 PERIODS

BOOKS FOR REFERENCES:

1. D.N.Chesney and M.O.Chesney Radio graphic imaging, CBS Publications, New Delhi, 1987.
2. Peggy, W., Roger D.Ferimarch, MRI for Technologists, Mc Graw Hill, New York, 1995.
3. Steve Webb, The Physics of Medical Imaging, Taylor & Francis, New York.1988.

SEMESTER V
ELECTIVE -VI

17271E53CP MOBILE AD HOC NETWORKS

3 0 0 3

UNIT I INTRODUCTION 9

Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV END -TO - END DELIVERY AND SECURITY 9

Transport layer: Issues in designing- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V CROSS LAYER DESIGN AND INTEGRATION OF ADHOC FOR 4G 9

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:- Architecture, methods of co-operation, co-operative antennas, Integration of ad hoc network with other wired and wireless networks.

TOTAL : 45 PERIODS

REFERENCES:

1. C.Siva Ram Murthy and B.S.Manoj, "Ad hoc Wireless Networks Architectures and protocols", 2nd edition, Pearson Education. 2007.
2. Charles E. Perkins, "Ad hoc Networking", Addison – Wesley, 2000.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, "Mobile adhoc networking", Wiley-IEEE press, 2004.
4. Mohammad Ilyas, "The handbook of adhoc wireless networks", CRC press, 2002.
5. T. Camp, J. Boleng, and V. Davies "A Survey of Mobility Models for Ad Hoc Network Research," Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2, no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , "A survey of integrating IP mobility protocols and Mobile Ad hoc networks", IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer "Cross layer design optimization in wireless protocol stacks", Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, "ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks", World Wireless cong., San Francisco, CA,May 2004.

SEMESTER V
ELECTIVE -VI

17271E53DP	**ULTRAWIDE BAND COMMUNICATION**	**L T P C** **3 0 0 3**

UNIT I INTRODUCTION TO UWB 9

History, Definition, FCC Mask, UWB features, UWB Interference: IEEE 802.11.a Interference, Signal to Interference ratio calculation, Interference with other wireless services.

UNIT II UWB TECHNOLOGIES AND CHANNEL MODELS 9

Impulse Radio , Pulsed Multiband, Multiband OFDM, features : Complexity, Power Consumption, Security and achievable data rate. MIMO Multiband OFDM, Differential multiband ofdm, Performacne characterization Ultra Wide Band Wireless Channels

Channel model: Impulse Response Modeling of UWB Wireless Channels, IEEE UWB channel model, Path loss, Delay profiles, Time and frequency modeling.

UNIT III UWB SIGNAL PROCESSING 9

Data Modulation schemes, UWB Multiple Access Modulation, BER, Rake Receiver, Transmit-Reference (T-R) Technique, UWB Range- Data Rate Performance, UWB Channel Capacity UWB Wireless Locationing: Position Locationing Methods, Time of Arrival Estimation, NLOS Location Error , Locationing with OFDM

UNIT IV UWB ANTENNAS 9

Antenna Requirements, Radiation Mechanism of the UWB Antennas, Types of Broad band antennas, Parameters, Analysis of UWB Antennas, Link Budget for UWB System. Design examples of broad band UWB antennas.

UNIT V UWB APPLICATIONS AND REGULATIONS 9

Wireless Ad hoc Networking, UWB Wireless Sensor, RFID , Consumer Electronics and Personal ,Asset Location, Medical applications UWB Regulation and standards in various countries , UWB Regulation in ITU, IEEE Standardization

COURSE OUTCOMES:

Students learn about

- Radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum

REFERENCES:

1. Homayoun Nikookar and Ramjee Prasad, "Introduction to Ultra Wideband for Wireless Communications"1st Edition, Springer Science & Business Media B.V. 2009.
2. Thomas Kaiser, Feng Zheng "Ultra Wideband Systems with MIMO", 1st Edition, John Wiley & Sons Ltd, Newyork, 2010.
3. W. Pam Siriwongpairat and K. J. Ray Liu, "Ultra-Wideband Communications Systems: Multiband OFDM approach" John Wiley and IEEE press, Newyork 2008.

PRIST

DEEMED TO BE

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NAAC ACCREDITED

THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

PROGRAM HANDBOOK

B.TECH – FULL TIME

[REGULATION 2017]

COURSE STRUCTURE

I - VIII SEMESTERS CURRICULUM AND SYLLABI
B.TECH (FT) CSE [REGULATION 2017]

SEMESTER I

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	17147S11	Communicative English	5	1	0	4
2.	17148S12	Engineering Mathematics I	5	1	0	4
3.	17149S13	Engineering Physics	5	1	0	4
4.	17149S14	Engineering Chemistry	5	1	0	4
5.	17154S15	Engineering Graphics	5	1	0	4
6.	17150S16	Problem Solving and Python Programming	5	1	0	4
		PRACTICAL				
7.	17150L17	Problem Solving and Python Programming Lab	0	0	3	2
8.	17149L18	Physics and Chemistry Laboratory	0	0	3	2
9.	171VEA19	Value Education				1
		TOTAL	**30**	**6**	**6**	**29**

SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1	17147S21	Technical English	5	1	0	4
2	17148S22A	Engineering Mathematics – II	5	1	0	4
3	17149S23A	Physics for Information Science	5	1	0	4
4	17149S24A	Environmental Science And Engineering	5	1	0	4
5	17153S25A	Basic Electrical, Electronics And measurement Engineering	5	1	0	4
6	17150S26A	Programming in C	5	1	0	4
		PRACTICAL				
7	17154L27	Engineering Practices Lab	0	0	3	2
8	17150L28A	C Programming Lab	0	0	3	2
9	171ICA29	Fundamentals of Indian constitution and Economy				1
		TOTAL	30	6	6	29

SEMESTER III

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17148C31A	Discrete Mathematics	4	0	0	4
2.	17150C32	Digital Principles and System Design	4	0	0	4
3.	17150C33	Data Structures	3	0	0	3
4.	17150C34	Object Oriented Programming	3	0	0	3
5.	17150C35	Communication Engineering	3	0	0	3
PRACTICAL						
6.	17150L36	Data Structures Laboratory	0	0	3	2
7.	17150L37	Object Oriented Programming Laboratory	0	0	3	2
8.	17150L38	Digital Systems Laboratory	0	0	3	2
9.	17150L39	Interpersonal Skills/Listening &Speaking	0	0	2	1
		TOTAL	17	**0**	**11**	**24**

SEMESTER IV

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17148S41A	Probability and Queueing Theory	4	0	0	4
2	17150C42	Computer Architecture	3	0	0	3
3	17150C43	Database Management Systems	3	0	0	3
4	17150C44	Design and Analysis of Algorithms	3	0	0	3
5	17150C45	Operating Systems	3	0	0	3
6	17150C46	Software Engineering	3	0	0	3
PRACTICAL						
7	17150L47	Database Management Systems Laboratory	0	0	3	2
8	17150L48	Operating Systems Laboratory	0	0	3	2
9	17150L49	Advanced Reading and Writing	0	0	2	1
Research Skill Based (RSB) Course						
10	17150CRS	Research Led Seminar				1
		TOTAL	**19**	**0**	**8**	**25**

SEMESTER V

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17148S51A	Algebra and Number Theory	4	0	0	4
2	17150C52	Computer Networks	3	0	0	3
3	17150C53	Microprocessors and Microcontrollers	3	0	0	3
4	171__FE54__	Free Elective - I	3	0	0	3
5	17150C55	Theory of Computation	3	0	0	3
6	17150C56	Object Oriented Analysis and Design	3	0	0	3
PRACTICAL						
7	17150L57	Microprocessors and Microcontrollers Laboratory	0	0	3	2
8	17150L58	Object Oriented Analysis and Design Laboratory	0	0	3	2
9	17150L59	Networks Laboratory	0	0	3	2
Research Skill Based (RSB) Course						
10	17150CRM	Research Methodology	3	0	0	3
		TOTAL	**22**	**0**	**9**	**28**

SEMESTER VI

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150C61	Internet Programming	3	0	0	3
2	17150C62	Artificial Intelligence	3	0	0	3
3	17150C63	Mobile Computing	3	0	0	3
4	17150C64	Compiler Design	3	0	2	4
5	17150C65	Distributed Systems	3	0	0	3
6	17150E66__	Elective - I	3	0	0	3
PRACTICAL						
7	17150L67	Internet Programming Laboratory	0	0	3	2
8	17150L68	Mobile Application Development Laboratory	0	0	3	2
9	17150L69	Mini Project	0	0	2	1
10	17150L6PC	Professional Communication	0	0	2	1
Research Skill Based (RSB) Course						
11	17150CBR	Participation in Bounded Research				2
		TOTAL	18	**0**	**12**	**27**

SEMESTER VII

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150C71	Principles of Management	3	0	0	3
2	17150C72	Cryptography and Network Security	3	0	0	3
3	17150C73	Cloud Computing	3	0	0	3
4	171__FE74__	Free Elective - II	3	0	0	3
5	17150E75__	Elective - II	3	0	0	3
6	17150E76__	Elective - III	3	0	0	3
PRACTICAL						
7	17150L77	Cloud Computing Laboratory	0	0	3	2
8	17150L78	Security Laboratory	0	0	3	2
Research Skill Based (RSB) Course						
9	17150CSR	Design/Socio Technical Project				4
		TOTAL	**18**	0	**6**	**26**

SEMESTER VIII

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E81__	Elective - IV	3	0	0	3
2	17150E82__	Elective - V	3	0	0	3
3	17150COM	COMPS				2
PRACTICAL						
4	17150P83	Project Work	0	0	20	10
		TOTAL	6	**0**	**20**	**18**

ELECTIVE I (SEMESTER VI)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E66A	Data Warehousing and Data Mining	3	0	0	3
2	17150E66B	Software Testing	3	0	0	3
3	17150E66C	Embedded Systems	3	0	0	3
4	17150E66D	Agile Methodologies	3	0	2	3
5	17150E66E	Graph Theory and Applications	3	0	0	3
6	17150E66F	Digital Signal Processing	3	0	0	3
7	17150E66G	Intellectual Property Rights	3	0	0	3

ELECTIVE II (SEMESTER VII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E75A	Big Data Analytics	3	0	0	3
2	17150E75B	Machine Learning Techniques	3	0	0	3
3	17150E75C	Computer Graphics and Multimedia	3	0	0	3
4	17150E75D	Software Project Management	3	0	2	3
5	17150E75E	Internet of Things	3	0	0	3
6	17150E75F	Service Oriented Architecture	3	0	0	3
7	17150E75G	Total Quality Management	3	0	0	3

ELECTIVE III (SEMESTER VII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E76A	Multi-core Architectures and Programming	3	0	0	3
2	17150E76B	Human Computer Interaction	3	0	0	3
3	17150E76C	C# and .Net Programming	3	0	0	3
4	17150E76D	Wireless Adhoc and Sensor Networks	3	0	2	3
5	17150E76E	Advanced Topics on Databases	3	0	0	3
6	17150E76F	Foundation Skills in Integrated Product Development	3	0	0	3
7	17150E76G	Human Rights	3	0	0	3
8	17150E76H	Disaster Management	3	0	0	3

ELECTIVE IV (SEMESTER VIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E81A	Digital Image Processing	3	0	0	3
2	17150E81B	Social Network Analysis	3	0	0	3
3	17150E81C	Information Security	3	0	0	3
4	17150E81D	Software Defined Networks	3	0	2	3
5	17150E81E	Cyber Forensics	3	0	0	3
6	17150E81F	Soft Computing	3	0	0	3
7	17150E81G	Professional Ethics in Engineering	3	0	0	3

ELECTIVE V (SEMESTER VIII)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1	17150E82A	Information Retrieval Techniques	3	0	0	3
2	17150E82B	Green Computing	3	0	0	3
3	17150E82C	GPU Architecture and Programming	3	0	0	3
4	17150E82D	Natural Language Processing	3	0	2	3
5	17150E82E	Parallel Algorithms	3	0	0	3
6	17150E82F	Speech Processing	3	0	0	3
7	17150E82G	Fundamentals of Nano Science	3	0	0	3

FREE ELECTIVE I (SEMESTER V)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	17150FE54A	Database Management Systems	~~3~~	~~0~~	~~0~~	~~3~~
2.		17150FE54B	Cloud Computing	~~3~~	~~0~~	~~0~~	~~3~~
3.	ECE	17152FE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
4.		17152FE54B	Sensors And Transducers	3	0	0	3
5.	EEE	17153FE54A	Industrial Nano Technology	3	0	0	3
6.		17153FE54B	Energy Conservation and Management	3	0	0	3
7.	MECH	17154FE54A	Renewable energy sources	3	0	0	3
8.		17154FE54B	Automotive Systems	3	0	0	3
9.	CIVIL	17155FE54A	Air Pollution And Control Engineering	3	0	0	3
10.		17155FE54B	Geographic Information Systems	3	0	0	3

FREE ELECTIVE II (SEMESTER VII)

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	17150FE74A	Introduction To C Programming	~~3~~	~~0~~	~~0~~	~~3~~
2.		17150FE74B	Data Structures and Algorithms	~~3~~	~~0~~	~~0~~	~~3~~
3.	ECE	17152FE74A	Robotics	3	0	0	3
4.		17152FE74B	Electronic Devices	3	0	0	3
5.	EEE	17153FE74A	Basic circuit Theory	3	0	0	3

6.		17153FE74B	Introduction to Renewable Energy system	3	0	0	3
7.	MECH	17154FE74A	Industrial Safety	3	0	0	3
8.		17154FE74B	Testing Of Materials	3	0	0	3
9.	CIVIL	17155FE74A	Waste Water Management	3	0	0	3
10.		17155FE74B	Green Building Design	3	0	0	3

Human value

Environment and sustainability **Gender Sensitization** **Professional Ethics**

COMMUNICATIVE ENGLISH

L	T	P	C
5	1	0	4

OBJECTIVES:

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

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

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

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures – Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave- Language development – prepositions, conjunctions Vocabulary development- guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one‘s friend- Language development- Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development- synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

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

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.

17148S12	ENGINEERING MATHEMATICS – I	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I DIFFERENTIAL CALCULUS **12**

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

UNIT II FUNCTIONS OF SEVERAL VARIABLES **12**

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

UNIT III INTEGRAL CALCULUS 12

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

UNIT IV MULTIPLE INTEGRALS **12**

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

UNIT V DIFFERENTIAL EQUATIONS **12**

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

TOTAL: 60 PERIODS

OUTCOMES:

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

- Use both the limit definition and rules of differentiation to 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.

17149S13 ENGINEERING PHYSICS

17149S13	ENGINEERING PHYSICS	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I PROPERTIES OF MATTER **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.

17149S14	ENGINEERING CHEMISTRY	L	T	P	C
		5	1	0	4

OBJECTIVES:

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

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, 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-O2 fuel cell.

TOTAL : 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:

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.

17150S16	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.

17154S15	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.

TEXTBOOKS:

1. Natrajan K.V., ―A text book of Engineering Graphics‖, Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., ―Engineering Graphics‖, New Age International (P) Limited, 2008.

REFERENCES:

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

Publication of Bureau of Indian Standards:

1. IS 10711 – 2001: Technical products Documentation – Size and 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

17150L17 **PROBLEM SOLVING AND PYTHON PROGRAMMING** **L T P C**

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.

17149L18	**PHYSICS AND CHEMISTRY LABORATORY** **(Common to all branches of B.E. / B.Tech Programmes)**	**L T P C**

0 0 3 2

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

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

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 (8TH edition, 2014).**

17147S21 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.

17148S22	**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.

17149S23A	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.

17153S25A **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.

17149S24A	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		5	1	0	4

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world;
- envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth‟s interior and
- surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **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.

17150S26A	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.

17154L27	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.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools: (a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos
(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No.
5. Power Tools: (a) Range Finder 2 Nos
(b) Digital Live-wire detector 2 Nos

ELECTRONICS

1. Soldering guns 10 Nos.
2. Assorted electronic components for making circuits 50 Nos.
3. Small PCBs 10 Nos.
4. Multimeters 10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply

17150L28A	C PROGRAMMING LABORATORY	L	T	P	C
		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

TOTAL: 60 PERIODS

OUTCOMES:

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

- Develop C programs for simple applications making use of basic constructs, arrays and strings.
- Develop C programs involving functions, recursion, pointers, and structures.
- Design applications using sequential and random access file processing.

17148C31A	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.

17150C32	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.

L T P C

17150C33 **DATA STRUCTURES**

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

17150C34	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.

17150C35	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.

17150L36	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

17150L37 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.

17150L38	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**.**

17150L39 **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

17148C41A	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.

17150C42 **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.

17150C43 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.

17150C44 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/

17150C45	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.

17150C46	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

17150L47 **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

17150L48	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

17150L49	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

17148C51A **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.

17150C52 **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.

17150C53 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

17150C55 **THEORY OF COMPUTATION**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the language hierarchy
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems.

UNIT I AUTOMATA FUNDAMENTALS **9**

Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

UNIT II REGULAR EXPRESSIONS AND LANGUAGES **9**

Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III CONTEXT FREE GRAMMAR AND LANGUAGES **9**

CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV PROPERTIES OF CONTEXT FREE LANGUAGES **9**

Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V UNDECIDABILITY **9**

Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post‘s Correspondence Problem, The Class P and NP.

TOTAL : 45 PERIODS

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:

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

17150C56 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.

17150L57 **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

17150L58 **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

17150L59 **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.

17150CRM

RESEARCH METHODOLOGY

Common to (Civil, Mechanical, EEE, ECE, CSE)

L	T	P	C
3	0	0	3

OBJECTIVES:

To create a basic appreciation towards research process and awareness of various research publication

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to standard laboratory precautions and best practices for experimental work
- To provide orientation for basic mathematical computation useful in basic research

UNIT I **9**

Introduction to Research – Definition, Objectives, Motivation and purpose – types of research – Pure and applied, survey, case study experimental, exploratory – Research Design – Steps in selection and formulation of research problem - Steps in research – Criteria of Good Research, Problems Encountered by Researchers in India.

UNIT II **9**

Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem - Research design - Needs and features of good design - Different research design - Basic principles of experimental designs. Development of a research plan, Formulation of Hypothesis – Sampling techniques –Sampling error and sample size. Literature types-compendia and tables of information, Reviews, General treatises, Monographs.

UNIT III **9**

Methods of data collection – Primary and secondary data – observation – interview –Questionnaire – Tools for questionnaire; surveying & literature survey, spreadsheets, Technical writing, Construction of tools for data collection – testing validity – pilot study and pre-testing, Survey vs Experiment, Practical Exercises. Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection.

UNIT IV **9**

Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis-Uncertainty, accuracy and precision- Mean value; standard deviation; error on the mean-Using a spreadsheet for data analysis- Graphs and graph plotting-Least squares methods – descriptive statistics – elements of processing through computer- packages for analysis (Excel

UNIT V **9**

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references, Technical Presentation.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Ability to carry out independent literature survey corresponding to the specific publication type and assess basic experimental as well as conceptual set up.

TEXTBOOKS:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

REFERENCES:

1. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.
2. R.A Day and A.L.Underwood, Quantitative analysis, Prentice Hall, 1999.
3. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.
4. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.
5. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

17150C61 **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.

17150C62 **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.

17150C63	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

TOTAL : 45 PERIODS

OUTCOMES:

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

- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

TEXTBOOKS:

1. Jochen Schiller, ―Mobile Communications‖, 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

17150C64 **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.

17150C65	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.

17150L67 **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.

17150L68	**MOBILE APPLICATION DEVELOPMENT LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**2**

OBJECTIVES:

- To understand the components and structure of mobile application development frameworks for Android and windows OS based mobiles.
- To understand how to work with various mobile application development frameworks.
- To learn the basic and important design concepts and issues of development of mobile applications.
- To understand the capabilities and limitations of mobile devices.

LIST OF EXPERIMENTS

1. Develop an application that uses GUI components, Font and Colours
2. Develop an application that uses Layout Managers and event listeners.
3. Write an application that draws basic graphical primitives on the screen.
4. Develop an application that makes use of databases.
5. Develop an application that makes use of Notification Manager
6. Implement an application that uses Multi-threading
7. Develop 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.

17150LPC **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.

17150C71 **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

17150C72 **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

17150C73	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.

17150L77 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.

17150L78 **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 -

17150E66A 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.

17150E66B	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.

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.

17150E66C **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.

17150E66D **AGILE METHODOLOGIES**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I AGILE METHODOLOGY **9**

Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management –Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

UNIT II AGILE PROCESSES **9**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT **9**

Agile Information Systems – Agile Decision Making - Earl_S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING **9**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile– Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization –Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE **9**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.
- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

TEXTBOOKS:

1.David J. Anderson and Eli Schragenheim, ―Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results‖, Prentice Hall, 2003.
2. Hazza and Dubinsky, ―Agile Software Engineering, Series: Undergraduate Topics in Computer Science‖, Springer, 2009.

REFERENCES:

1 Craig Larman, ―Agile and Iterative Development: A Manager_s Guide‖, Addison-Wesley, 2004.
2. Kevin C. Desouza, ―Agile Information Systems: Conceptualization, Construction, and Management‖, Butterworth-Heinemann, 2007.

17150E66E **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.

17150E66F **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.

17150E66G **INTELLECTUAL PROPERTY RIGHTS**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

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 REGISTRATION OF IPRs **10**

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 AGREEMENTS AND LEGISLATIONS 10

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV DIGITAL PRODUCTS AND LAW **9**

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V ENFORCEMENT OF IPRs **7**

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:

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

TEXTBOOKS:

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.

17150E75A **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.

17150E75B **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.

17150E75C	COMPUTER GRAPHICS AND MULTIMEDIA	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To develop an understanding and awareness how issues such as content, information architecture, motion, sound, design, and technology merge to form effective and compelling interactive experiences for a wide range of audiences and end users.
- To become familiar with various software programs used in the creation and implementation of multi- media
- To appreciate the importance of technical ability and creativity within design practice.
- To gain knowledge about graphics hardware devices and software used.
- To understand the two-dimensional graphics and their transformations.
- To understand the three-dimensional graphics and their transformations.
- To appreciate illumination and color models
- To become familiar with understand clipping techniques
- To become familiar with Blender Graphics

9

UNIT I ILLUMINATION AND COLOR MODELS

Light sources - basic illumination models – halftone patterns and dithering techniques; Properties of light - Standard primaries and chromaticity diagram; Intuitive colour concepts - RGB colour model - YIQ colour model - CMY colour model - HSV colour model - HLS colour model; Colour selection. Output primitives – points and lines, line drawing algorithms, loading the frame buffer, line function; circle and ellipse generating algorithms; Pixel addressing and object geometry, filled area primitives.

UNIT II TWO-DIMENSIONAL GRAPHICS 9

Two dimensional geometric transformations – Matrix representations and homogeneous coordinates, composite transformations; Two dimensional viewing – viewing pipeline, viewing coordinate reference frame; window-to-viewport coordinate transformation, Two dimensional viewing functions; clipping operations – point, line, and polygon clipping algorithms.

UNIT III THREE-DIMENSIONAL GRAPHICS 9

Three dimensional concepts; Three dimensional object representations – Polygon surfaces- Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces; Blobby objects; Spline representations – Bezier curves and surfaces -B-Spline curves and surfaces. TRANSFORMATION AND VIEWING: Three dimensional geometric and modelling transformations – Translation, Rotation, Scaling, composite transformations; Three dimensional viewing – viewing pipeline, viewing coordinates, Projections, Clipping; Visible surface detection methods.

UNIT IV MULTIMEDIA SYSTEM DESIGN & MULTIMEDIA FILE HANDLING 9

Multimedia basics − Multimedia applications − Multimedia system architecture − Evolving technologies for multimedia − Defining objects for multimedia systems − Multimedia data interface standards − Multimedia databases. Compression and decompression − Data and 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 and user interface - Hypermedia messaging -Mobile messaging − Hypermedia message component − Creating hypermedia message − Integrated multimedia message standards − Integrated document management − Distributed multimedia systems.CASE STUDY:

BLENDER GRAPHICS Blender Fundamentals – Drawing Basic Shapes – Modelling – Shading & Textures

TOTAL : 45 PERIODS

OUTCOMES:

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

- Design two dimensional graphics.
- Apply two dimensional transformations.
- Design three dimensional graphics.
- Apply three dimensional transformations.
- Apply Illumination and color models.
- Apply clipping techniques to graphics.
- Understood Different types of Multimedia File Format
- Design Basic 3d Scenes using Blender

TEXTBOOKS:

1. Donald Hearn and Pauline Baker M, ―Computer Graphics", Prentice Hall, New Delhi, 2007 [UNIT I – III]
2. Andleigh, P. K and Kiran Thakrar, ―Multimedia Systems and Design‖, PHI, 2003. [UNITIV,V]

REFERENCES:

1. Judith Jeffcoate, ―Multimedia in practice: Technology and Applications‖, PHI, 1998.
2. Foley, Vandam, Feiner and Hughes, ―Computer Graphics: Principles and Practice‖, 2nd Edition, Pearson Education, 2003.
3. Jeffrey McConnell, ―Computer Graphics: Theory into Practice‖, Jones and Bartlett Publishers,2006.
4. Hill F S Jr., "Computer Graphics", Maxwell Macmillan , 1990.
5. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, KelvinSung, and AK Peters, ―Fundamentals of Computer Graphics‖, CRC Press, 2010.
6. William M. Newman and Robert F.Sproull, ―Principles of Interactive Computer Graphics‖, Mc Graw Hill 1978. https://www.blender.org/support/tutorials/

17150E75D **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.

17150E75E **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

17150E75F **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

17150E75G **TOTAL QUALITY MANAGEMENT**

L	T	P	C
3	0	0	3

OBJECTIVES:

- 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

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 TQM TOOLS AND TECHNIQUES II 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 QUALITY MANAGEMENT SYSTEM 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:

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

TEXTBOOKS:

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.

17150E76A **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.

17150E76B	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)

17150E76C	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.

17150E76D **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.

17150E76E **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.

17150E76F **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:

At the end of the course, the student should 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
3. Hill, Fifth Edition, 2011.
4. 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

17150E76G **HUMAN RIGHTS**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I FUNDAMENTALS OF IoT **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 IoT PROTOCOLS **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 DESIGN AND DEVELOPMENT **9**

Theories and perspectives of UN Laws – UN Agencies to monitor and compliance.

UNIT IV DATA ANALYTICS AND SUPPORTING SERVICES **9**

Human Rights in India – Constitutional Provisions / Guarantees.

UNIT V CASE STUDIES/INDUSTRIAL APPLICATIONS **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

OUTCOMES:

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

- 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.

17150E76H **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 Processess and Framework at State and Central Level- State Disaster Management Authority(SDMA) – Early Warning System – Advisories from Appropriate Agencies.

9

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT

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:

At the end of the course, the student should 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, Scenarious 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.

17150E81A **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

17150E81B **SOCIAL NETWORK ANALYSIS**

L	T	P	C
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.

17150E81C **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.

17150E81D **SOFTWARE DEFINED NETWORKS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of software defined networks.
- To understand the separation of the data plane and the control plane.
- To study about the SDN Programming.
- To study about the various applications of SDN

UNIT I INTRODUCTION **9**

History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – Why SDN – Evolution of SDN – How SDN Works – Centralized and Distributed Control and Date Planes

UNIT II OPEN FLOW & SDN CONTROLLERS **9**

Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor- Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts

UNIT III DATA CENTERS **9**

Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE

UNIT IV SDN PROGRAMMING **9**

Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications

UNIT V SDN **9**

Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration

TOTAL : 45 PERIODS

OUTCOMES:

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

- Analyze the evolution of software defined networks
- Express the various components of SDN and their uses
- Explain the use of SDN in the current networking scenario
- Design and develop various applications of SDN

TEXTBOOKS:

1. Paul Goransson and Chuck Black, ―Software Defined Networks: A ComprehensiveApproach, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, ―SDN: Software Defined Networks, O'Reilly Media, 2013.

REFERENCES:

1. Siamak Azodolmolky, ―Software Defined Networking with Open Flow, Packet Publishing, 2013.
2. Vivek Tiwari, ―SDN and Open Flow for Beginners‖, Amazon Digital Services, Inc.,2013.
3. Fei Hu, Editor, ―Network Innovation through Open Flow and SDN: Principles and Design, CRC Press, 2014.

17150E81E	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.

17150E81F	SOFT COMPUTING	L	T	P	C
		3	1	0	4

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.

17150E81G **PROFESSIONAL ETHICS IN ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I HUMAN VALUES **10**

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

UNIT II ENGINEERING ETHICS **9**

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

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION **9**

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

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

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

UNIT V GLOBAL ISSUES **8**

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

TOTAL : 45 PERIODS

OUTCOMES:

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

- To apply ethics in society, discuss the ethical issues related to engineering and realize the responsibilities and rights in the society.

TEXTBOOKS:

1. Mike W. Martin and Roland Schinzinger, ―Ethics in Engineering‖, Tata McGraw Hill, New Delhi, 2003.

2. Govindarajan M, Natarajan S, Senthil Kumar V. S, ―Engineering Ethics‖, Prentice Hall of India, New Delhi, 2004.

REFERENCES:

1. Charles B. Fleddermann, ―Engineering Ethics‖, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, ―Engineering Ethics –
3. Concepts and Cases‖, Cengage Learning, 2009.
4. John R Boatright, ―Ethics and the Conduct of Business‖, Pearson Education, New Delhi, 2003
5. Edmund G Seebauer and Robert L Barry, ―Fundamentals of Ethics for Scientists and
6. Engineers‖, Oxford University Press, Oxford, 2001.
7. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for Personal
8. Integrity and Social Responsibility‖ Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
9. 6. World Community Service Centre, ‗ Value Education', Vethathiri publications, Erode, 2011.

17150E82A **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.

17150E82B **GREEN COMPUTING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To learn the fundamentals of Green Computing.
- To analyze the Green computing Grid Framework.
- To understand the issues related with Green compliance.
- To study and develop various case studies..

UNIT I FUNDAMENTALS **9**

Green IT Fundamentals: Business, IT, and the Environment – Green computing: carbon foot print, scoop on power – Green IT Strategies: Drivers, Dimensions, and Goals – Environmentally Responsible Business: Policies, Practices, and Metrics.

UNIT II GREEN ASSETS AND MODELING **9**

Green Assets: Buildings, Data Centers, Networks, and Devices – Green Business Process Management: Modeling, Optimization, and Collaboration – Green Enterprise Architecture – Environmental Intelligence – Green Supply Chains – Green Information Systems: Design and Development Models.

UNIT III GRID FRAMEWORK **9**

Virtualization of IT systems – Role of electric utilities, Telecommuting, teleconferencing and teleporting – Materials recycling – Best ways for Green PC – Green Data center – Green Grid framework.

UNIT IV GREEN COMPLIANCE **9**

Socio-cultural aspects of Green IT – Green Enterprise Transformation Roadmap – Green Compliance: Protocols, Standards, and Audits – Emergent Carbon Issues: Technologies and Future.

UNIT V CASE STUDIES **9**

The Environmentally Responsible Business Strategies (ERBS) – Case Study Scenarios for Trial Runs – Case Studies – Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
- Enhance the skill in energy saving practices in their use of hardware.
- Evaluate technology tools that can reduce paper waste and carbon footprint by the stakeholders.
- Understand the ways to minimize equipment disposal requirements .

TEXTBOOKS:

1. Bhuvan Unhelkar, ―Green IT Strategies and Applications-Using Environmental Intelligence‖, CRC Press, June 2014.
2. Woody Leonhard, Katherine Murray, ―Green Home computing for dummies‖, August 2012..

REFERENCES:

1. Alin Gales, Michael Schaefer, Mike Ebbers, ―Green Data Center: steps for the Journey , Shroff/IBM rebook, 2011.
2. John Lamb, ―The Greening of IT‖, Pearson Education, 2009.
3. Jason , ―Green Computing and Green IT- Best Practices on regulations &industry, Lulu.com, 2008

17150E82C **GPU ARCHITECTURE AND PROGRAMMING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics of GPU architectures
- To write programs for massively parallel processors
- To understand the issues in mapping algorithms for GPUs
- To introduce different GPU programming models

UNIT I GPU ARCHITECTURE **12**

Evolution of GPU architectures - Understanding Parallelism with GPU –Typical GPU Architecture - CUDA Hardware Overview - Threads, Blocks, Grids, Warps, Scheduling - Memory Handling with CUDA: Shared Memory, Global Memory, Constant Memory and Texture Memory.

UNIT II CUDA PROGRAMMING **8**

Using CUDA - Multi GPU - Multi GPU Solutions - Optimizing CUDA Applications: Problem Decomposition, Memory Considerations, Transfers, Thread Usage, Resource Contentions.

UNIT III PROGRAMMING ISSUES **8**

Common Problems: CUDA Error Handling, Parallel Programming Issues, Synchronization, Algorithmic Issues, Finding and Avoiding Errors.

UNIT IV OPENCL BASICS **8**

OpenCL Standard – Kernels – Host Device Interaction – Execution Environment – Memory Model – Basic OpenCL Examples.

UNIT V ALGORITHMS ON GPU **9**

Parallel Patterns: Convolution, Prefix Sum, Sparse Matrix - Matrix Multiplication – Programming Heterogeneous Cluster.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Describe GPU Architecture
- Write programs using CUDA, identify issues and debug them
- Implement efficient algorithms in GPUs for common application kernels, such as matrix multiplication
- Write simple programs using OpenCL
- Identify efficient parallel programming patterns to solve problems

TEXTBOOKS:

1. Shane Cook, CUDA Programming: ―A Developer's Guide to Parallel Computing with GPUs (Applications of GPU Computing), First Edition, Morgan Kaufmann, 2012.
2. David R. Kaeli, Perhaad Mistry, Dana Schaa, Dong Ping Zhang, ―Heterogeneous computing with OpenCL‖, 3rd Edition, Morgan Kauffman, 2015.

REFERENCES:

1. Nicholas Wilt, ―CUDA Handbook: A Comprehensive Guide to GPU Programming, Addison - Wesley, 2013.
2. Jason Sanders, Edward Kandrot, ―CUDA by Example: An Introduction to General Purpose
3. GPU Programming‖, Addison - Wesley, 2010.
4. David B. Kirk, Wen-mei W. Hwu, Programming Massively Parallel Processors - A Hands-on
5. Approach, Third Edition, Morgan Kaufmann, 2016.
6. http://www.nvidia.com/object/cuda_home_new.html
7. http://www.openCL.org

17150E82D	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.

17150E82E **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.

17150E82F **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

17150E82G | **FUNDAMENTALS OF NANO SCIENCE**

L	T	P	C
3	0	0	3

OBJECTIVES:

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

UNIT I INTRODUCTION 8

Nanoscale Science and Technology- Implications 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

17150FE54A **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.

17150FE54B **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.

17152FE54A **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.

17152FE54B **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

9

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors **-** Smart Sensors **-** Film sensor, MEMS & Nano Sensors, LASER sensors.

9

UNIT V **ALTERNATIVE ENERGY SOURCES**

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and 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.

17153FE54A **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)

17153FE54B **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.

17154FE54A **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

17154FE54B **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.

17155FE54A **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.

17155FE54B **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.

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

LIST OF FREE ELECTIVE - II

17150FE74A **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 – 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: 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

17150FE74B 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

17152FE74A **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.

17152FE74B **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.

17153FE74A **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.

17153FE74B 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.

17154FE74A **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.

17154FE74B **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.

17155FE74A **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

17155FE74B **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", 4^{th} ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., "Industrial Water Pollution Control", 2^{nd} Edn., McGraw Hill Inc., 1989.

REFERENCES

1. S.P. Mahajan, "Pollution control in process industries", 27^{th} Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, "Green Chemistry: An Introductory Text", 2^{nd} 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 UNIVERSITY
VALLAM, THANJAVUR.

DEPARTMENT OF
COMPUTER SCIENCE & ENGINEERING

PROGRAM HANDBOOK

B.TECH CSE(PART-TIME)

[REGULATION 2017]
[For candidates admitted to B.Tech CSE program from June 2017 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

SEMESTER I

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17148S11P	Transforms and Partial Differential Equations	3	1	0	4
17152S12P	Digital Systems	3	1	0	4
17150H13P	Data Structures and algorithms	3	1	0	4
17150H14P	Computer Architecture and Organization	3	1	0	4
17150H15P	Object Oriented Programming	3	0	0	3
Total No. of credits					**19**

SEMESTER II

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17148S21P	Numerical Methods	3	1	0	4
17150H22P	Microprocessors and Interfacing	3	1	0	4
17150H23P	Database Management Systems	3	1	0	4
17150H24P	Design and Analysis Of Algorithm	3	1	0	4
17150H25P	Software Engineering	3	0	0	3
Total No. of credits					**19**

SEMESTER III

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17148S31P	Discrete Mathematics	3	1	0	4
17150H32P	Operating System	4	0	0	4
17150H33P	Artificial Intelligence	4	0	0	4
17150H34P	Computer Networks	4	0	0	4
17150L35P	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	
17150H41P	Principles Of Cryptography	3	1	0	4
17150H42P	Web Technology	3	1	0	4
17150H43P	C# And .Net Framework	3	1	0	4
171_ _E44_P	**Elective-I**	3	1	0	4
17150L45P	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	
17150H51P	Object Oriented Analysis and Design	4	0	0	4
17150H52P	Software Quality Management	3	1	0	4
17150H53P	Graphics and Multimedia	3	1	0	4
171_ _E54_P	**Elective –II**	3	1	0	4
17150L55P	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	
17150H61P	Embedded Systems	4	0	0	4
17150H62P	Advanced Java programming	3	1	0	4
17150H63P	Software Testing	4	0	0	4

171_ _E64_P	**Elective III**	4	0	0	4
17150L65P	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	
17160S71P	Total Quality Management	3	0	0	3
17150H72P	Grid Computing	4	0	0	4
17150H73P	Middleware Technologies	3	1	0	4
171_ _E74_P	**Elective IV**	3	0	0	3
17150P75P	Project	0	0	12	6
Total No. of credits					**20**

CREDITS DISTRIBUTION

TOTALCREDITS : 130

LIST OF ELECTIVES

SEMESTER – IV (ELECTIVE I)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17150E44AP	Theory of Computation	3	1	0	4
17150E44BP	Real Time Systems	3	1	0	4
17150E44CP	User Interface Design	3	1	0	4
17150E44DP	Advanced Databases	3	1	0	4

SEMESTER - V(ELECTIVE II)

SEMESTER – VI(ELECTIVE III)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17160E64AP	Principles of Management	4	0	0	4
17150E64BP	Unix Internals	4	0	0	4
17150E64CP	Parallel Computing	4	0	0	4
17150E64DP	Programming paradigms	4	0	0	4

SEMESTER – VII (ELECTIVE VI)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17150E73AP	High Speed Networks	3	0	0	3
17150E73BP	Bio Informatics	3	0	0	3
17150E73CP	Software Project Management	3	0	0	3
17150E73DP	Digital Image Processing	3	0	0	3

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
17150E54AP	Soft Computing	3	1	0	4
17150E54BP	Principles of Compiler Design	3	1	0	4
17150E54CP	Distributed Systems	3	1	0	4
17150E54DP	Mobile Computing	3	1	0	4

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 IFOURIERSERIES 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

CSE/Sem I

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– COMPUTERARCHITECTURE AND ORGANIZATION

AIM:

To understand the basic structure and organization of digital computer.

OBJECTIVES:

- To have a thorough understanding of operation of a digital computer.
- To list the operation of the arithmetic unit .
- To study in detail the different types of control and the concept of pipelining.
- To understand the hierarchy of memories.
- To study the different ways of communicating with I/O devices and standard I/O interfaces.

UNIT I BASIC STRUCTURE OF COMPUTERS 10+3

Functional units - Basic operational concepts - Bus structures - Software performance – Memory locations and addresses – Memory operations – Instruction and instruction sequencing – Addressing modes – Assembly language

UNIT II ARITHMETIC UNIT 8+3

Addition and subtraction of signed numbers – Design of fast adders – Multiplication of positive numbers - Signed operand multiplication and fast multiplication – Integer division

UNIT III BASIC PROCESSING UNIT 9+3

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Microprogrammed control - Pipelining – Basic concepts – Data hazards – Instruction hazards –Superscalar operation.

UNIT IV MEMORY SYSTEM 9+3

Basic concepts – Semiconductor RAMs - ROMs – Speed - size and cost – Cache memories - Performance consideration – Virtual memory- Memory Management requirements – Secondary storage.

UNIT V I/O ORGANIZATION 9+3

Accessing I/O devices – Interrupts – Direct Memory Access – Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB).

TOTAL: 60hrs

TEXT BOOK:

1. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, 5th Edition "Computer Organization", McGraw-Hill, 2002.

REFERENCES:

1. William Stallings, "Computer Organization and Architecture – Designing for Performance", 6th Edition, Pearson Education, 2003.
2. David A. Patterson and John L.Hennessy, "Computer Organization and Design: The hardware / software interface", 2nd Edition, Morgan Kaufmann, 2002.
3. John P.Hayes, "Computer Architecture and Organization", 3rd Edition, McGraw Hill, 1998.

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-orienteddesign
- 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 WesleyPublications, 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 andStatistical 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 linearSystem 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 andStirling's formula - Lagrangian Polynomials – Divided difference method.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numericalintegration 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 differencesolution of one dimensional heat equation by explicit and implicit methods – One dimensionalwave 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.

CSE/Sem II

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.

TEXTBOOKS:

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, 5th edition, 2001.

REFERENCES:

1. Ian Sommerville, Software engineering, Pearson education Asia, 6th edition, 2000.
2. Pankaj Jalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F Peters and Witold 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 – Contrapositive – Logical equivalences and implications – DeMorgan's Laws - Normal forms – Principal conjunctive and disjunctive normal forms – Rules of inference – Arguments - Validity of arguments.

UNIT II PREDICATE CALCULUS 9 + 3hrs

Predicates – Statement function – Variables – Free and bound variables – Quantifiers – Universe of discourse – Logical equivalences and implications for quantified statements – Theory of inference – The rules of universal specification and generalization – Validity of arguments.

UNIT III SET THEORY 10 + 3hrs

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs andCartesian 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.

CSE/Sem III

17150H32P- OPERATING SYSTEM

AIM:

To understand the functions of an operating system.

OBJECTIVES:

- To have an overview of different types of operating systems.
- To know the components of an operating system.
- To have a knowledge of process management and storage management.
- To know the concepts of I/O and file systems.
- To know the concepts of Distributed Operating System

UNIT I 9

Introduction - Mainframe systems – Desktop Systems – Multiprocessor Systems – Distributed Systems – Clustered Systems – Real Time Systems – Handheld Systems - Hardware Protection - System Components – Operating System Services – System Calls – System Programs - Process Concept – Process Scheduling – Operations on Processes – Cooperating Processes – Inter-process Communication.

UNIT II 9

Threads – Overview – Threading issues - CPU Scheduling – Basic Concepts – Scheduling Criteria – Scheduling Algorithms – Multiple-Processor Scheduling – Real Time Scheduling - The Critical-Section Problem – Synchronization Hardware – Semaphores – Classic problems of Synchronization – Critical regions – Monitors.

UNIT III 9

System Model – Deadlock Characterization – Methods for handling Deadlocks -Deadlock Prevention – Deadlock avoidance – Deadlock detection – Recovery from Deadlocks - Storage Management – Swapping – Contiguous Memory allocation – Paging – Segmentation – Segmentation with Paging.

UNIT IV 9

Virtual Memory – Demand Paging – Process creation – Page Replacement – Allocation of frames – Thrashing - File Concept – Access Methods – Directory Structure – File System Mounting – File Sharing – Protection

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 ofEnglish – 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.

CSE/Sem IV

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 : 60hrs

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#”, 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
4. S. Thamarai Selvi, R. Murugesan, “A Textbook on C#”, Pearson Education, 2003.

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. Embeddedprocessors – 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/Odevices 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 ComputerSystem 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 aProcess – Basic Definitions – Software Testing Principles – The Tester's Role in aSoftware Development Organization – Origins of Defects – Defect Classes – The DefectRepository and Test Design – Defect Examples – Developer/Tester Support forDeveloping a Defect Repository.

UNIT II TEST CASE DESIGN 9

Introduction to Testing Design Strategies – The Smarter Tester – Test Case DesignStrategies – Using Black Box Approach to Test Case Design Random Testing –Requirements based testing – positive and negative testing -— Boundary ValueAnalysis – decision tables - Equivalence Class Partitioning state-based testing– causeeffectgraphing – 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 FlowGraphs – 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 UnitTests. The Test Harness – Running the Unit tests and Recording results – Integrationtests – 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 testspecialist – 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 – designand architecture for automation – requirements for a test tool – challenges in automation- Test metrics and measurements –project, progress and productivity metrics – StatusMeetings – Reports and Control Issues – Criteria for Test Completion – SCM – Types ofreviews – Developing a review program – Components of Review Plans– ReportingReview Results. – evaluating software quality – defect prevention – testing maturitymodel

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.

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

17150S71P-TOTAL QUALITY MANAGEMENT

AIM:

Learning various TQM techniques to tackle and analyze problems in improving quality with particular reference to their own working environment.

OBJECTIVE:

- Develop the ability to adopt new techniques and synthesize new knowledge.
- Analyze basic operational and research data using TQM techniques in a systematic way.
- Cooperate efficiently and effectively in a team to apply TQM techniques and tools for accomplishing pre-determined goals.
- Identify opportunities for improvement in the business, service, administrative and manufacturing environments of applying the methodology such as Six Sigma, Kaizen, and other appropriate tools to achieve breakthrough improvements in these processes.

UNIT I FUNDAMENTALS 9

Definition of quality − Dimensions of quality − Quality planning − Quality costs −Analysis techniques for quality costs − Basic concepts of total quality management −Historical review − Principles of TQM − Leadership − Concepts − Role of senior management − Quality council − Quality statements − Strategic planning − Deming philosophy − Barriers to TQM implementation.

UNIT II TQM PRINCIPLES 9

Customer Satisfaction − Customer Perception of Quality − Customer Complaints −Service Quality − Customer Retention − Employee Involvement – Motivation −Empowerment − Teams − Recognition and Reward − Performance Appraisal −Benefits − Continuous Process Improvement − Juran Trilogy − 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.

UNIT IV TQM TOOLS 9

Benchmarking − Reasons to Benchmark − Benchmarking Process − Quality Function Deployment (QFD) − House of Quality − QFD Process − Benefits − Taguchi Quality Loss Function − Total Productive Maintenance (TPM) − Concept − Improvement Needs − FMEA − Stages of FMEA.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 and Other Quality Systems − ISO 9000:2000 Quality System – Elements − Implementation of Quality System−Documentation−Quality Auditing−TS 16949−ISO 14000 – Concept−Requirements and Benefits.

Total: 45hrs

TEXT BOOK:

1. 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.

17150H72P - GRID COMPUTING

AIM:

To introduce the what's, why's and how's of Grid Computing; what is Grid Computing able to do for you today and what will it bring to you in time to come.

OBJECTIVES:

- Understand and explain the basic concepts of Grid Computing;
- Explain the advantages of using Grid Computing within a given environment;
- Prepare for any upcoming Grid deployments and be able to get started with a potentially available Grid setup.

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.

17150H73P -MIDDLEWARE TECHNOLOGIES

AIM:

Students are able to gain in-depth knowledge popular middlewareplatforms.

OBJECTIVES:

Students can able to

- Understand that middleware is an intermediary software layer between the application and the operatingsystem, which encapsulates the heterogeneity of the underlying communicationnetwork, 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 withEJB.

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 withCORBA.

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 – Undecidable 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. TaskClasses, Performance Measures for Real Time Systems, Estimating Program Runtimes. Task Assignment and Scheduling - Classical Uniprocessor scheduling algorithms,UniProcessor scheduling of IRIS Tasks, Task Assignment, Mode Changes, and FaultTolerant Scheduling.

UNIT II PROGRAMMING LANGUAGES AND TOOLS 9+3

Programming Language and Tools – Desired Language characteristics, Data Typing,Control structures, Facilitating Hierarchical Decomposition, Packages, Run-time(Exception) Error handling, Overloading and Generics, Multitasking, Low Levelprogramming, Task scheduling, Timing Specifications, Programming Environments,Run-time Support.

UNIT III REAL TIME DATABASES 9+3

Real time Databases - Basic Definition, Real time Vs General Purpose Databases, MainMemory Databases, Transaction priorities, Transaction Aborts, Concurrency ControlIssues, Disk Scheduling Algorithms, Two-phase Approach to improve Predictability,Maintaining Serialization Consistency, Databases for Hard Real Time systems.

UNIT IV COMMUNICATION 9+3

Real-Time Communication - Communications Media, Network Topologies Protocols,Fault Tolerant Routing. Fault Tolerance Techniques - Fault Types, Fault Detection. FaultError containment Redundancy, Data Diversity, Reversal Checks, Integrated Failurehandling.

UNIT V EVALUATION TECHNIQUES 9+3

Reliability Evaluation Techniques - Obtaining Parameter Values, Reliability Models forHardware Redundancy, Software Error models. Clock Synchronization - Clock, ANonfault-Tolerant Synchronization Algorithm, Impact of Faults, Fault TolerantSynchronization 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 ManipulationGraphical 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: 60hrs

TEXT BOOKS:

1. Wilbent. O. Galitz ,"The Essential Guide To User Interface Design", John Wiley& Sons, 2001.

2. Ben Sheiderman, “Design The User Interface”, Pearson Education, 1998.

REFERENCES:

1. Alan Cooper, “The Essential Of User Interface Design”, Wiley – Dream Tech Ltd.,2002.

CSE/Sem IV/Electives

17150E44DP- ADVANCED DATABASES

AIM:

To have strong knowledge on Database Management Systems, Database technologies , an application-oriented , system-oriented approach towards databasedesign.

OBJECTIVES:

- Be able to design high-quality relational databases and database applications.
- Have developed skills in advanced visual & conceptual modeling anddatabase design.
- Be able to translate complex conceptual data models into logical andphysical database designs.
- Have developed an appreciation of emerging database trends as theyapply 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 andTerminology – Set-theoretic Operations – Member Function Formulation andParameterization – Fuzzy Rules and Fuzzy Reasoning – Extension Principle and FuzzyRelations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – InputSpace 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 SimplexSearch.

UNIT III ARTIFICIAL INTELLIGENCE 10+3

Introduction, Knowledge Representation – Reasoning, Issues and Acquisition:Prepositional and Predicate Calculus Rule Based knowledge Representation SymbolicReasoning Under Uncertainity Basic knowledge Representation Issues Knowledgeacquisition – Heuristic Search: Techniques for Heuristic search Heuristic Classification -State Space Search: Strategies Implementation of Graph Search Search based onRecursion 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 FuzzyModeling – Framework Neuron Functions for Adaptive Networks – Neuro FuzzySpectrum.

UNIT V APPLICATIONS OF COMPUTATIONAL INTELLIGENCE 8+3

Printed Character Recognition – Inverse Kinematics Problems – Automobile FuelEfficiency Prediction – Soft Computing for Color Recipe Prediction.

TOTAL: 60hrs

TEXT BOOKS:

1. J.S.R.Jang, C.T.Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

2. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford University Press, 2006.

REFERENCES:

1. Elaine Rich & Kevin Knight, "Artificial Intelligence" , Second Edition, Tata Mcgraw HillPublishing 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 ENVIRONMENTS9+3

Introduction– Principal Sources of Optimization – Optimization of basic Blocks – Introduction to Global Data Flow Analysis – RuntimeEnvironments – 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-OperatingSystem Services- Assumptions About Hardware. Introduction to the Kernel-ArchitectureSystem Concepts-Data Structures- System Administration.

UNIT II **9**

The Buffer Cache-Headers-Buffer Pool-Buffer Retrieval-Reading and Writing DiskBlocks-Advantages and Disadvantages. Internal Representation of Files-Inodes-Structure-Directories-Path Name to Inode- Super Block-Inode Assignment-Allocation ofDisk Blocks -Other File Types.

UNIT III **9**

System Calls for the File System-Open-Read-Write-Lseek-Close-Create-Special filesCreation-Change Directory and Change Root-Change Owner and Change Mode- Stat-Fstat-Pipes-Dup-Mount-Unmount-Link-Unlink-File System Abstraction-Maintenance.

UNIT IV **9**

The System Representation of Processes-States-Transitions-System Memory-Contextof a Process-Saving the Context-Manipulation of a Process Address Space-SleepProcess Control-signals-Process Termination-Awaiting-Invoking other Programs-TheShell-System Boot and the INIT Process.

UNIT V **9**

Memory Management Policies-Swapping-Demand Paging-a Hybrid System-I/OSubsystem-Driver Interfaces-Disk Drivers-Terminal Drivers.

TOTAL: 45 hrs

TEXTBOOK:

1**.** Maurice J. Bach, "The Design of the Unix Operating System", Pearson Education, 2002.

REFERENCES:

1. Uresh Vahalia, "UNIX Internals: The New Frontiers", Prentice Hall, 2000.
2. John Lion, "Lion's Commentary on UNIX", 6th edition, Peer-to-PeerCommunications, 2004.
3. Daniel P. Bovet & Marco Cesati, “Understanding the Linux Kernel”, O’REILLY, ShroffPublishers &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 IIENABLING 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-orientedprogramming paradigms.
- Implement several programs in languages other than the one emphasized in thecore curriculum (Java/C++).
- Understand design/implementation issues involved with variable allocation andbinding, 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 – layoutmanagement – Swing Components

UNIT IV GENERIC PROGRAMMING 9

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics – exceptions – exception hierarchy – throwing and catching exceptions – Stack Trace Elements - assertions – logging

UNIT V CONCURRENT PROGRAMMING 9

Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – thread-safe Collections – Executors – synchronizers – threads and event-driven programming.

] **TOTAL:45hrs**

TEXT BOOK:

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

REFERENCES:

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Second Revised Edition, Tata McGraw-Hill, 2000.
2. John J. Donovan "Systems Programming", Tata McGraw-Hill Edition, 2000.
3. John R. Levine, Linkers & Loaders – Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, 2000.

SEMESTER – VII (ELECTIVE VI)
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 – proteinstructure – chemical bonds – molecular biology tools – genomic information content.

UNIT II **9**

Data searches – simple alignments – gaps – scoring matrices – dynamic programming –global and local alignments – database searches – multiple sequence alignmentsPatterns 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 – treeconfidence – comparison of phylogenetic methods – molecular phylogenies.

UNIT IV **9**

Genomics – prokaryotic genomes: prokaryotic gene structure – GC content – genedensity – 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 quaternarystructure – algorithms for modeling protein folding – structure prediction – predictingRNA secondary structuresProteomics – protein classification – experimental techniques – inhibitors and drugdesign – ligand screening – NMR structures – empirical methods and predictiontechniques – 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 overthe Life Cycle - Test Artifacts - Management Artifacts - Engineering Artifacts - Pragmatic Artifacts. Model-BasedSoftware Architectures - Management Perspective - Technical Perspective. Workflows of the Process - Software ProcessWorkflows - Iteration Workflows - Checkpoints of the Process.

UNIT 3 SOFTWARE MANAGEMENT DISCIPLINES 9

Iterative Process Planning - Work Breakdown Structures - Conventional WBS Issues - Planning Guidelines - Cost and Schedule Estimating Process - Iteration Planning Process. Project Organizations and Responsibilities - Line-of-BusinessOrganizations - Project Organizations - Evolution of Organizations. Process Automation - Tools: Automation BuildingBlocks - Project Environment - Round-Trip Engineering - Change Management. Project Control and ProcessInstrumentation - Seven Core Metrics - Management Indicators - Quality Indicators - . Pragmatic Software Metrics -Metrics Automation.

UNIT 4 PROJECT PROFILES 9

Continuous Integration - Early Risk Resolution - Evolutionary Requirements - Teamwork among Stakeholders - Top 10 Software Management Principles - Software Management Best Practices - Next-Generation Software Economics - Next-Generation Cost Models - Modern Software Economics - Modern Process Transitions.

UNIT 5 PROJECT EXECUTION AND CLOSURE 9

Review Process – Planning - Overview and Preparation - Group Review Meeting - Rework and Follow-up – Guidelines for Reviews in Projects - Analysis and Control Guidelines – Case Studies. Project Monitoring and Control – ProjectTracking - Activities Tracking - Defect Tracking - Issues Tracking - Status Reports - Milestone Analysis. DefectAnalysis and Prevention - Process Monitoring and Audit. Project Closure – Analysis - Analysis Report.

TOTAL 45hrs

TEXT BOOKS:

1. Walker Royce, "*Software Project Management: A Unified Framework*", Pearson, 2000
2. Pankaj Jalote, "*Software Project Management in Practice*", Pearson, 2002.

REFERENCES:

1. Joel Henry, "*Software Project Management: A Real-World Guide to Success*". Pearson, 2004.
2. Kathy Schwalbe, "*Information Technology Project Management*", Course Technology, 2005

17150E73DP-DIGITAL IMAGE PROCESSING

AIM:

The purpose of this course is to introduce the basic concept and methodologies for digital image processing.

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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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THANJAVUR – 613 403 - TAMIL NADU

DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING

PROGRAM HANDBOOK

M.Tech

COMPUTER SCIENCE AND ENGINEERING

[FULL TIME]

[REGULATION 2017]

COURSE STRUCTURE

SEMESTER – I

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	17248S11A	Higher Mathematics	3	1	0	4
I	17250H12	Modern Operating System	4	0	0	4
I	17250H13	Parallel and High Performance Computing	4	0	0	4
I	17250H14	Adhoc and Sensor Network	4	0	0	4
I	17250H15	Advanced Data Structures and Algorithms	3	1	0	4
I	17250E16_	Elective - I	4	0	0	4
Practical						
I	17250L17	Advanced Web Technologies Lab	-	-	3	3
Research Skill Development(RSD) Courses						
I	**17250HRS**	**Research Led Seminar**	**1**	**0**	**0**	**1**
Total no of Credit					**28**	

SEMESTER – II

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	17250H21	Middleware Technologies	3	1	0	4
II	17250H22	Object Oriented Software Engineering	4	0	0	4
II	17250H23	Digital Image Processing	4	0	0	4
II	17250E24_	Elective II	4	0	0	4
II	17250E25_	Elective – III	4	0	0	4
Practical						
II	17250L26	.NET Technologies Lab	-	-	3	3
II	172TECWR	Technical Writing /Seminars	-	-	3	3
Research Skill Development(RSD) Courses						
II	17250HRM	Research Methodology	**3**	**0**	**0**	**3**
II	17250HBR	Participation in Bounded Research (Level 2)	**2**	**0**	**0**	**2**
Total no of Credit					**31**	

SEMESTER – III

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250H31	Software Project Management	4	0	0	4
III	17250E32_	Elective-IV	4	0	0	4
III	17250E33_	Elective-V	4	0	0	4
III	17250E34_	Elective-VI	4	0	0	4
III	17250P35	Project Work- Phase I*	-	-	6	6
Research Skill Development(RSD) Courses						
III	**17250HSR**	**Participation in Scaffolded Research (Level 3)**	**0**	**0**	**4**	**4**
Total no of Credit					**26**	

SEMESTER – IV

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	17250P41	Project Work- Phase II*	-	-	12	12
Total no of Credit					**12**	

*** - Only review will be conducted**

LIST OF ELECTIVES

SEMESTER – I - ELECTIVE – I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	17250E16A	Multimedia Systems	4	0	0	4
I	17250E16B	Genetic Algorithms	4	0	0	4
I	17250E16C	Software Metrics	4	0	0	4

SEMESTER – II - ELECTIVE – II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	17250E24A	Advanced Distributed Computing	4	0	0	4
II	17250E24B	Data Warehousing & Data Mining	4	0	0	4
II	17250E24C	Artificial Neural Networks	4	0	0	4

SEMESTER – II - ELECTIVE – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	17250E25A	Service Oriented Architecture	4	0	0	4
II	17250E25B	High Speed Networks	4	0	0	4
II	17250E25C	Embedded Systems	4	0	0	4

SEMESTER – III - ELECTIVE – IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E32A	Cloud Computing	4	0	0	4
III	17250E32B	Information Security	4	0	0	4
III	17250E32C	Soft Computing	4	0	0	4

SEMESTER – III - ELECTIVE – V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E33A	Advanced Database Technology	4	0	0	4
III	17250E33B	Mobile Communication Computing	4	0	0	4
III	17250E33C	Green Computing	4	0	0	4

SEMESTER – III - ELECTIVE – VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E34A	Software Quality Assurance	4	0	0	4
III	17250E34B	Bio-Informatics	4	0	0	4
III	17250E34C	Wireless Application Protocols	4	0	0	4

Human value

Environment and sustainability

Gender Sensitization

Professional Ethics

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.

CSE/Semester - I

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.

17250H13 - PARALLEL AND HIGH PERFORMANCE COMPUTING

L T P C
4 0 0 4

AIM:
The main objective of this paper is to make the students to know the need of Parallel Computing.

OBJECTIVES:

- To understand the models and parameters used.
- To understand the Matrix Algorithms and Design Issues.

Unit I : Introduction : 9

Need for Parallel Computing - Scope of Parallel Computing - Issues in Parallel Computing - Parallel Processing Concepts (Overview) - Levels of parallelism (instruction, transaction, task, thread, memory, function) - Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc) -Architectures.

Unit II : Models of Parallel Computing : 9

Taxonomy of Parallel Architectures -Dynamic Interconnection Networks - Static Interconnection Networks - Message Transfer - Reduction, Parallel Prefix - GPU thread model.

Unit III : Performance Modelling : 9

Metrics – Granularity – Scalability – Overhead – Isoefficiency.

Unit IV : Matrix Algorithms : 9

Matrix Partitioning - Matrix Transposition - Matrix Vector Multiply - Matrix Multiply - CUDA, vector add, matrix multiply, sequence alignment - Linear Equations - LU(P) Decomposition

Unit V : Fundamental Design Issues in Parallel Computing 9

Synchronization – Scheduling - Job Allocation -Job Partitioning - Dependency Analysis - Mapping Parallel Algorithms onto Parallel Architectures - Performance Analysis of Parallel Algorithms

Total : 45 hrs

TEXTBOOK:

Introduction to Parallel Computing, 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)

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

CSE/Semester - I

17250H15 - ADVANCED DATA STRUCTURES AND ALGORITHMS

L T P C
3 1 0 4

194

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.

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

CSE/Semester - II

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
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**

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

CSE/Elective –I/Semester - I

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

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

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.

CSE/Elective –II/Semester - II

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

CSE/Elective –III/Semester - II

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
4 0 0 4

AIM:

To study the various performance and analysis issues involved in high-speed data transmission.

OBJECTIVES:

Be able to

- Describe and interpret the basics of high speed networking technologies.
- Apply the concept learnt in this course to optimize and troubleshoot high-speed network.
- Demonstrate the knowledge of network planning and optimization

UNIT - 1 : HIGH SPEED NETWORKS 9

Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11

UNIT - 2 : CONGESTION AND TRAFFIC MANAGEMENT 9

Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

UNIT - 3 : TCP AND ATM CONGESTION CONTROL 9

TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

UNIT - 4 : INTEGRATED AND DIFFERENTIATED SERVICES 9

Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services

UNIT - 5 : PROTOCOLS FOR QOS SUPPORT 9

RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol Architecture, Data Transfer Protocol, 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

CSE/Elective –III/Semester - II

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

CSE/Elective –IV/Semester – III

REFERENCE BOOKS:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. *Cloud Computing: Principles and Paradigms*, *Editors: Rajkumar* Buyya, *James* Broberg, Andrzej *M.* Goscinski, *Wile, 2011*
3. *Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee* Gillam, *Springer, 2012*
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

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**

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.

Total = 45 hrs

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

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

Total :45hrs

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
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
IV	Research Led Seminar	1
V	Research Methodology	3
VI	Participation in Bounded Research	2
VII	Design Project/ Socio Technical Project (Scaffolded Research)	4
VIII	Project Work	12

- **Blueprint for assessment of student's performance in Research Led Seminar Course**

- **Internal Assessment:** **40 Marks**
  - Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
  - Seminar Review Presentation : 10 Marks
  - Literature Survey : 10 Marks
- **Semester Examination :** **60 Marks**

(Essay type Questions set by the concerned resource persons)

- **Blueprint for assessment of student's performance in Design Project**

- **Continuous Internal Assessment through Reviews:** **40 Marks**
  - Review I : 10 Marks
  - Review II : 10 Marks
  - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report:** **40 Marks**
- **Viva- Voce Examination:** **20 Marks**
- **Total:** **100 Marks**

- **Blueprint for assessment of student's performance in Research Methodology Courses**

Continuous Internal Assessment: **20 Marks**

- Research Tools(Lab) : 10 Marks
- Tutorial : 10 Marks

Model Paper Writing: **40 Marks**

- Abstract : 5 Marks
- Introduction : 10 Marks
- Discussion : 10 Marks
- Review of Literature : 5 Marks

- Presentation : 10 Marks

Semester Examination: **40 Marks**

Total: **100 Marks**

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PRIST UNIVERSITY

VALLAM, THANJAVUR.

DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING

PROGRAM HANDBOOK

M.Tech

COMPUTER SCIENCE AND ENGINEERING

[PART TIME]

[REGULATION 2017]

[**for candidates admitted to M.Tech CSE program from June 2017 onwards**]

COURSE STRUCTURE

SEMESTER – I

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	17248S11AP	Higher Mathematics	3	1	0	4
I	17250H12P	Adhoc & Sensor Networks	4	0	0	4
I	17250H13P	Advanced Data Structures	4	0	0	4
Practical						
I	17250L14P	Advanced Web Technologies Lab	-	-	3	3
Research Skill Development(RSD) Courses						
I	**17250HRSP**	**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	17250H21P	Middleware Technologies	3	1	0	4
II	17250H22P	Digital Image Processing	4	0	0	4
II	17250E23_P	Elective I	4	0	0	4
Practical						
II	17250L24P	.NET Technologies Lab	-	-	3	3
II	172TECWRP	Technical Writing /Seminars	-	-	3	3
Research Skill Development(RSD) Courses						
II	**17250HRMP**	**Research Methodology**	**3**	**0**	**0**	**3**
II	**17250HBRP**	**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	17250H31P	Modern Operating System	4	0	0	4
III	17250E32P	Parallel and High Performance Computing	4	0	0	4
III	17250E33_P	Elective-II	4	0	0	4
Research Skill Development(RSD) Courses						
III	**17250CSRP**	**Participation in Scaffolded Research**	**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	13250H41P	Object Oriented Software Engineering	4	0	0	4
IV	13250H42P	Software Project Management	4	0	0	4
IV	13250E43_P	Elective-V	4	0	0	4
IV	13250P44P	Project Work- Phase I*	-	-	6	6
Total no of Credits					**18**	

*** - Only review will be conducted**

SEMESTER – V

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
V	17250E51_P	Elective-IV	4	0	0	4
V	17250E52_P	Elective-V	4	0	0	4
V	17250E53_P	Elective-VI	4	0	0	4
Total no of Credits						**12**

*** - Only review will be conducted**

SEMESTER – VI

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
VI	17250P61P	Project Work- Phase II*	-	-	12	12
Total no of Credits						**12**

*** - Only review will be conducted**

LIST OF ELECTIVES

SEMESTER – II ELECTIVE – I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	17250E23AP	Advanced Distributed Computing	4	0	0	4
II	17250E23BP	Data Warehousing & Data Mining	4	0	0	4
II	17250E23CP	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	17250E33AP	Multimedia Systems	4	0	0	4
III	17250E33BP	Genetic Algorithms	4	0	0	4
III	17250E33CP	Software Metrics	4	0	0	4

SEMESTER – IV - ELECTIVE – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	17250E43AP	Service Oriented Architecture	4	0	0	4
II	17250E43BP	High Speed Networks	4	0	0	4
II	17250E43CP	Embedded Systems	4	0	0	4

SEMESTER – V - ELECTIVE – IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E51AP	Cloud Computing	4	0	0	4
III	17250E51BP	Information Security	4	0	0	4
III	17250E51CP	Soft Computing	4	0	0	4

SEMESTER – V - ELECTIVE – V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E52AP	Advanced Database Technology	4	0	0	4
III	17250E52BP	Mobile Communication Computing	4	0	0	4
III	17250E52CP	Green Computing	4	0	0	4

SEMESTER – V - ELECTIVE – VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	17250E53AP	Software Quality Assurance	4	0	0	4
III	17250E53BP	Bio-Informatics	4	0	0	4
III	17250E53CP	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**	-	**-**	-	**-**	-	**-**
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**

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 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.

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
4	0	0	4

AIM:
The main objective of this paper is to make the students to know the need of Parallel Computing.

OBJECTIVES:

- To understand the models and parameters used.
- To understand the Matrix Algorithms and Design Issues.

Unit I : Introduction : 9

Need for Parallel Computing - Scope of Parallel Computing - Issues in Parallel Computing - Parallel Processing Concepts (Overview) - Levels of parallelism (instruction, transaction, task, thread, memory, function) - Models (SIMD, MIMD, SIMT, SPMD, Dataflow Models, Demand-driven Computation etc) -Architectures.

Unit II : Models of Parallel Computing : 9

Taxonomy of Parallel Architectures -Dynamic Interconnection Networks - Static Interconnection Networks - Message Transfer - Reduction, Parallel Prefix - GPU thread model.

Unit III : Performance Modelling : 9

Metrics – Granularity – Scalability – Overhead – Isoefficiency.

Unit IV : Matrix Algorithms : 9

Matrix Partitioning - Matrix Transposition - Matrix Vector Multiply - Matrix Multiply - CUDA, vector add, matrix multiply, sequence alignment - Linear Equations - LU(P) Decomposition

Unit V : Fundamental Design Issues in Parallel Computing 9

Synchronization – Scheduling - Job Allocation -Job Partitioning - Dependency Analysis - Mapping Parallel Algorithms onto Parallel Architectures - Performance Analysis of Parallel Algorithms

Total : 45 hrs

TEXTBOOK:

Introduction to Parallel Computing, 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
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.

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
3 0 0 3

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in basic computational and excel- skills for research in engineering.

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I

Introduction to Research — Criteria of Good Research, Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem-Basic principles of experimental designs-Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and Scaling – Different scales. Ethics & Misconduct in research, Plagiarism,

UNIT II

Formulation of Hypothesis – Sampling techniques –Sampling error and sample size-Methods of data collection – Primary and secondary data – observation – Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection- Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis.

UNIT III

Data Analysis using Excel- Tabulation of Data in excel (Creating Master Table and Sub Table), Formulas and Functions, Filters and Sort and Validation Lists, Data from External Sources. Data Analysis Using Charts and Graphs(Pivot Table & Charts), Time Value of Money, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, regression lines. Z-test, t- test F-test, ANOVA one way classification, Chi square test, independence of attributes. Time series: forecasting Method of least squares, Moving average method, Introduction to presentation tool, features and functions, Creating Presentation, Customizing presentation.

UNIT IV

Various research methods-Design of Experiments, Response Surface Methodology, Taguchi Methods- Modeling & Simulation of Engineering Systems, Artificial Neural Networks, Fuzzy Logic, MATLAB - Graph Theory- Finite Element Methods, Computational Fluid Dynamics -R programming in Statistics- open source software

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.

3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.

4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.

5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.

6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

17250H31 - SOFTWARE PROJECT MANAGEMENT

L T P C
4 0 0 4

AIM:

Software Project Management provides insight to the importance of careful project management

OBJECTIVES:

- Understand Project planning and management.
- Identify Client management and project definition.
- Understand testing based approach to development.
- Team management and ongoing schedule tracking.

UNIT I FUNDAMENTALS 9
Conventional Software Management – Evolution of Software Economics – Improving Software Economics – Conventional versus Modern Software Project Management.

UNIT II SOFTWARE MANAGEMENT PROCESS FRAMEWORK 9
Lifecycle Phases – Artifacts of the Process – Model Based Software Architectures – Workflows of the Process – Checkpoints of the Process.

UNIT III SOFTWARE MANAGEMENT DISCIPLINES 9
Iterative Process Planning – Organization and Responsibilities – Process Automation – Process Control and Process Instrumentation – Tailoring the Process.

UNIT IV MANAGED AND OPTIMIZED PROCESS 9
Data Gathering and Analysis – Principles of Data Gathering – Data Gathering Process – Software Measures – Data Analysis – Managing Software Quality – Defect Prevention.

UNIT V CASE STUDIES 9
COCOMO Cost Estimation Model – Change Metrics – CCPDS–R.

Total: 45hrs

TEXT BOOKS:

1. Walker Royce "Software Project Management A Unified Framework", Pearson Education, 2004
2. Humphrey Watts, "Managing the software process", Addison Wesley, 1989. (Unit IV)

REFERENCES:

1. Ramesh 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
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.

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
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.

17250E25B - HIGH SPEED NETWORKS

L T P C
4 0 0 4

AIM:

To study the various performance and analysis issues involved in high-speed data transmission.

OBJECTIVES:

Be able to

- Describe and interpret the basics of high speed networking technologies.
- Apply the concept learnt in this course to optimize and troubleshoot high-speed network.
- Demonstrate the knowledge of network planning and optimization

UNIT - 1 : HIGH SPEED NETWORKS 9
Frame Relay Networks - Asynchronous transfer mode - ATM Protocol Architecture, ATM logical Connection, ATM Cell - ATM Service Categories - AAL. High Speed LANs: Fast Ethernet, Gigabit Ethernet, Fiber Channel - Wireless LANs: applications, requirements - Architecture of 802.11

UNIT - 2 : CONGESTION AND TRAFFIC MANAGEMENT 9
Queuing Analysis- Queuing Models - Single Server Queues - Effects of Congestion - Congestion Control - Traffic Management - Congestion Control in Packet Switching Networks - Frame Relay Congestion Control.

UNIT - 3 : TCP AND ATM CONGESTION CONTROL 9
TCP Flow control - TCP Congestion Control - Retransmission - Timer Management - Exponential RTO backoff - KARN's Algorithm - Window management - Performance of TCP over ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RM cell formats, ABR Capacity allocations - GFR traffic management.

UNIT - 4 : INTEGRATED AND DIFFERENTIATED SERVICES 9
Integrated Services Architecture - Approach, Components, Services- Queuing Discipline, FQ, PS, BRFQ, GPS, WFQ - Random Early Detection, Differentiated Services

UNIT - 5 : PROTOCOLS FOR QOS SUPPORT 9
RSVP - Goals & Characteristics, Data Flow, RSVP operations, Protocol Mechanisms - Multiprotocol Label Switching - Operations, Label Stacking, Protocol details - RTP - Protocol

Architecture, Data Transfer Protocol, 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

CSE/Elective –IV/Semester – III

REFERENCE BOOKS:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Wile, 2011
3. Cloud Computing: Principles, Systems and Applications, Editors: Nikos Antonopoulos, Lee Gillam, Springer, 2012
4. Cloud Security: A Comprehensive Guide to Secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley-India, 2010

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

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.

Total = 45 hrs

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition, Pearson Education/Addison Wesley, 2007.
2. Thomas Cannolly and Carolyn Begg, “ Database Systems, A Practical Approach to Design, Implementation and Management”, Third Edition, Pearson Education, 2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, “Database System Concepts”, Fifth Edition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,”An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.

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

Total :45hrs

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.

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 .

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

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Mapping of Courses to Crosscutting Issues

2017R

Programme Name &Code	Course Code	Course Title	Gender Sensitization	Professional Ethics	Environment and Sustainability	Human Values
B.Tech 17UGCSEFT	17147S11	Communicative English	-	-	-	-
B.Tech 17UGCSEFT	17148S12	Engineering mathematics – i	-	-	-	-
B.Tech 17UGCSEFT	17149S13	Engineering physics	-	-	-	-
B.Tech 17UGCSEFT	17149S14	Engineering chemistry	-	-	-	-
B.Tech 17UGCSEFT	17150S16	Problem solving and python programming	-	-	-	-
B.Tech 17UGCSEFT	17154S15	Engineering graphics	-	-	-	-
B.Tech 17UGCSEFT	17150L17	Problem solving and python programming laboratory	-	-	-	-
B.Tech 17UGCSEFT	17149L18	Physics and chemistry laboratory	-	-	-	-
B.Tech 17UGCSEFT	171VEA19	Value education	-	-	-	✓
B.Tech 17UGCSEFT	17147S21	Technical english	-	-	-	-
B.Tech 17UGCSEFT	17148S22A	Engineering mathematics – ii	-	-	-	-
B.Tech 17UGCSEFT	17149S23A	Physics for information science	-	-	-	-
B.Tech 17UGCSEFT	17153S25A	Basic electrical, electronics and measurement engineering	-	-	-	-
B.Tech 17UGCSEFT	17149S24A	Environmental science and engineering	-	-	✓	-
B.Tech 17UGCSEFT	17150S26A	Programming in c	-	-	-	-

B.Tech 17UGCSEFT	17154L27	Engineering practices laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L28A	C - programming lab	-	-	-	-
B.Tech 17UGCSEFT	17148C31A	Discrete mathematics	-	-	-	-
B.Tech 17UGCSEFT	17150C32	Digital principles and system design	-	-	-	-
B.Tech 17UGCSEFT	17150C33	Data structures	-	-	-	-
B.Tech 17UGCSEFT	17150C34	Object oriented programming	-	-	-	-
B.Tech 17UGCSEFT	17150C35	Communication engineering	-	-	-	-
B.Tech 17UGCSEFT	17150L36	Data structures laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L37	Object oriented programming laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L38	Digital systems laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L39	Interpersonal skills/listening&speaking	-	-	-	-
B.Tech 17UGCSEFT	17148S41A	Probability and queuing theory	-	-	-	-
B.Tech 17UGCSEFT	17150C42	Computer architecture	-	-	-	-
B.Tech 17UGCSEFT	17150C43	Database management systems	-	-	-	-
B.Tech 17UGCSEFT	17150C44	Design and analysis of algorithms	-	-	-	-
B.Tech 17UGCSEFT	17150C45	Operating systems	-	-	-	-
B.Tech 17UGCSEFT	17150C46	Software engineering	-	-	-	-
B.Tech 17UGCSEFT	17150L47	Database management systems laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L48	Operating systems laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L49	Advanced reading and writing	-	-	-	-
B.Tech 17UGCSEFT	17150CRS	Research led seminar	-	-	-	-

B.Tech 17UGCSEFT	17148S51A	Algebra and number theory	-	-	-	-
B.Tech 17UGCSEFT	17150C52	Computer networks	-	-	-	-
B.Tech 17UGCSEFT	17150C53	Microprocessors and microcontrollers	-	-	-	-
B.Tech 17UGCSEFT	17150C55	Theory of computation	-	-	-	-
B.Tech 17UGCSEFT	17150C56	Object oriented analysis and design	-	-	-	-
B.Tech 17UGCSEFT	17150CRM	Research Methodology	-	-	-	-
B.Tech 17UGCSEFT	17150L57	Microprocessors and microcontrollers laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L58	Object oriented analysis and design laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L59	Networks laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150C61	Internet programming	-	-	-	-
B.Tech 17UGCSEFT	17150C62	Artificial intelligence	-	-	-	-
B.Tech 17UGCSEFT	17150C63	Mobile computing	-	-	-	-
B.Tech 17UGCSEFT	17150C64	Compiler design	-	-	-	-
B.Tech 17UGCSEFT	17150C65	Distributed systems	-	-	-	-
B.Tech 17UGCSEFT	17150L61	Internet programming laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L62	Mobile application development laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L63	Mini project	-	-	-	-
B.Tech 17UGCSEFT	17150L64	Professional communication	-	-	-	-
B.Tech 17UGCSEFT	17150CBR	Participation in bounded research	-	-	-	-
B.Tech 17UGCSEFT	17150C71	Principles of management	-	-	-	✓
B.Tech	17150C72	Cryptography and network	-	-	-	-

17UGCSEFT		security				
B.Tech 17UGCSEFT	17150C73	Cloud computing	-	-	-	-
B.Tech 17UGCSEFT	17150L77	Cloud computing laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150L78	Security laboratory	-	-	-	-
B.Tech 17UGCSEFT	17150P83	Project work	-	-	-	-
B.Tech 17UGCSEFT	17150E66A	Data warehousing and data mining	-	-	-	-
B.Tech 17UGCSEFT	17150E66B	Software testing	-	-	-	-
B.Tech 17UGCSEFT	17150E66C	Embedded systems	-	-	-	-
B.Tech 17UGCSEFT	17150E66D	Agile methodologies	-	-	-	-
B.Tech 17UGCSEFT	17150E66E	Graph theory and applications	-	-	-	-
B.Tech 17UGCSEFT	17150E66F	Digital signal processing	-	-	-	-
B.Tech 17UGCSEFT	17150E66G	Intellectual property rights	-	✓	-	-
B.Tech 17UGCSEFT	17150E75A	Big data analytics	-	-	-	-
B.Tech 17UGCSEFT	17150E75B	Machine learning techniques	-	-	-	-
B.Tech 17UGCSEFT	17150E75C	Computer graphics and multimedia	-	-	-	-
B.Tech 17UGCSEFT	17150E75D	Software project management	-	-	-	✓
B.Tech 17UGCSEFT	17150E75E	Internet of things	-	-	-	-
B.Tech 17UGCSEFT	17150E75F	Service oriented architecture	-	-	-	-
B.Tech 17UGCSEFT	17150E75G	Total quality management	-	-	-	✓
B.Tech 17UGCSEFT	17150E76A	Multi-core architectures and programming	-	-	-	-
B.Tech 17UGCSEFT	17150E76B	Human computer interaction	-	-	-	-
B.Tech 17UGCSEFT	17150E76C	C# and .net programming	-	-	-	-

B.Tech 17UGCSEFT	17150E76D	Wireless adhoc and sensor networks	-	-	-	-
B.Tech 17UGCSEFT	17150E76E	Advanced topics on databases	-	-	-	-
B.Tech 17UGCSEFT	17150E76F	Foundation skills in integrated product development	-	-	-	-
B.Tech 17UGCSEFT	17150E76G	Human rights	-	-	-	✓
B.Tech 17UGCSEFT	17150E76H	Disaster management	-	-	-	-
B.Tech 17UGCSEFT	17150E81A	Digital image processing	-	-	-	-
B.Tech 17UGCSEFT	17150E81B	Social network analysis	-	-	-	-
B.Tech 17UGCSEFT	17150E81C	Information security	-	-	-	-
B.Tech 17UGCSEFT	17150E81D	Software defined networks	-	-	-	-
B.Tech 17UGCSEFT	17150E81E	Cyber forensics	-	-	-	-
B.Tech 17UGCSEFT	17150E81F	Soft computing	-	-	-	-
B.Tech 17UGCSEFT	17150E81G	Professional ethics in engineering	-	✓	-	-
B.Tech 17UGCSEFT	17150E82A	Information retrieval techniques	-	-	-	-
B.Tech 17UGCSEFT	17150E82B	Green computing	-	-	-	-
B.Tech 17UGCSEFT	17150E82C	Gpu architecture and programming	-	-	-	-
B.Tech 17UGCSEFT	17150E82D	Natural language processing	-	-	-	-
B.Tech 17UGCSEFT	17150E82E	Parallel algorithms	-	-	-	-
B.Tech 17UGCSEFT	17150E82F	Speech processing	-	-	-	-
B.Tech 17UGCSEFT	17150E82G	Fundamentals of nano science	-	-	-	-
B.Tech 17UGCSEFT	1710P83	Project work	-	-	-	-
B.Tech 17UGCSEFT	17150FE54A	Cloud computing	-	-	-	-
B.Tech 17UGCSEFT	17150FE54B	Database management systems	-	-	-	-

B.Tech 17UGCSEFT	17152FE54A	Basics of bio medical instrumentation	-	-	-	-
B.Tech 17UGCSEFT	17152FE54B	Sensors and transducers	-	-	-	-
B.Tech 17UGCSEFT	17153FE54A	Industrial nano technology	-	-	-	-
B.Tech 17UGCSEFT	17153FE54B	Energy conservation and management	-	-	-	-
B.Tech 17UGCSEFT	17154FE54A	Renewable energy sources	-	-	-	-
B.Tech 17UGCSEFT	17154FE54B	Automotive systems	-	-	-	-
B.Tech 17UGCSEFT	17155FE54A	Air pollution and control engineering	-	-	-	-
B.Tech 17UGCSEFT	17152FE74A	Robotics	-	-	-	-
B.Tech 17UGCSEFT	17152FE74B	Electronic devices	-	-	-	-
B.Tech 17UGCSEFT	17153FE74A	Basic circuit theory	-	-	-	-
B.Tech 17UGCSEFT	17153FE74B	Introduction to renewable energy system	-	-	-	-
B.Tech 17UGCSEFT	17154FE74A	Industrial safety	-	-	-	-
B.Tech 17UGCSEFT	17154FE74B	Testing of materials	-	-	-	-
B.Tech 17UGCSEFT	17155FE74A	Waste water management	-	-	-	-
B.Tech 17UGCSEFT	17155FE74B	Green building design	-	-	-	-
B.Tech 17UGCSEFT	17150FE74A	Introduction to c programming	-	-	-	-
B.Tech 17UGCSEFT	17150FE74B	Data structures and algorithms	-	-	-	-
B.Tech 17UGCSEPT	17148S11P	Transforms and Partial Differential Equations	-	-	-	-
B.Tech 17UGCSEPT	17152S12P	Digital Systems	-	-	-	-
B.Tech 17UGCSEPT	17150H13P	Data Structures and algorithms	-	-	-	-
B.Tech 17UGCSEPT	17150H14P	Computer Architecture and Organization	-	-	-	-
B.Tech 17UGCSEPT	17150H15P	Object Oriented Programming	-	-	-	-

B.Tech 17UGCSEPT	17148S21P	Numerical Methods	-	-	-	-
B.Tech 17UGCSEPT	17150H22P	Microprocessors and Interfacing	-	-	-	-
B.Tech 17UGCSEPT	17150H23P	Database Management Systems	-	-	-	-
B.Tech 17UGCSEPT	17150H24P	Design and Analysis Of Algorithm	-	-	-	-
B.Tech 17UGCSEPT	17150H25P	Software Engineering	-	-	-	-
B.Tech 17UGCSEPT	17148S31P	Discrete Mathematics	-	-	-	-
B.Tech 17UGCSEPT	17150H32P	Operating System	-	-	-	-
B.Tech 17UGCSEPT	17150H33P	Artificial Intelligence	-	-	-	-
B.Tech 17UGCSEPT	17150H34P	Computer Networks	-	-	-	-
B.Tech 17UGCSEPT	17150L35P	Operating Systems and Networking Lab	-	-	-	-
B.Tech 17UGCSEPT	17150H41P	Principles Of Cryptography	-	-	-	-
B.Tech 17UGCSEPT	17150H42P	Web Technology	-	-	-	-
B.Tech 17UGCSEPT	17150H43P	C# And .Net Framework	-	-	-	-
B.Tech 17UGCSEPT	171_ _E44_P	Elective-I	-	-	-	-
B.Tech 17UGCSEPT	17150L45P	Internet Programming Lab	-	-	-	-
B.Tech 17UGCSEPT	17150H51P	Object Oriented Analysis and Design	-	-	-	-
B.Tech 17UGCSEPT	17150H52P	Software Quality Management	-	-	-	-
B.Tech 17UGCSEPT	17150H53P	Graphics and Multimedia	-	-	-	-
B.Tech 17UGCSEPT	171_ _E54_P	Elective –II	-	-	-	-
B.Tech 17UGCSEPT	17150L55P	Software Development Lab	-	-	-	-
B.Tech 17UGCSEPT	17150H61P	Embedded Systems	-	-	-	-
B.Tech 17UGCSEPT	17150H62P	Advanced Java programming	-	-	-	-

B.Tech 17UGCSEPT	17150H63P	Software Testing	-	-	-	-
B.Tech 17UGCSEPT	171_ _E64_P	Elective III	-	-	-	-
B.Tech 17UGCSEPT	17150L65P	Java Programming Lab	-	-	-	-
B.Tech 17UGCSEPT	17160S71P	Total Quality Management	-	-	-	✓
B.Tech 17UGCSEPT	17150H72P	Grid Computing	-	-	-	-
B.Tech 17UGCSEPT	17150H73P	Middleware Technologies	-	-	-	-
B.Tech 17UGCSEPT	171_ _E74_P	Elective IV	-	-	-	-
B.Tech 17UGCSEPT	17150P75P	Project	-	-	-	-
B.Tech 17UGCSEPT	17150E44AP	Theory of Computation	-	-	-	-
B.Tech 17UGCSEPT	17150E44BP	Real Time Systems	-	-	-	-
B.Tech 17UGCSEPT	17150E44CP	User Interface Design	-	-	-	-
B.Tech 17UGCSEPT	17150E44DP	Advanced Databases	-	-	-	-
B.Tech 17UGCSEPT	17160E64AP	Principles of Management	-	-	-	✓
B.Tech 17UGCSEPT	17150E64BP	Unix Internals	-	-	-	-
B.Tech 17UGCSEPT	17150E64CP	Parallel Computing	-	-	-	-
B.Tech 17UGCSEPT	17150E64DP	Programming paradigms	-	-	-	-
B.Tech 17UGCSEPT	17150E73AP	High Speed Networks	-	-	-	-
B.Tech 17UGCSEPT	17150E73BP	Bio Informatics	-	-	-	-
B.Tech 17UGCSEPT	17150E73CP	Software Project Management	-	-	-	✓
B.Tech 17UGCSEPT	17150E73DP	Digital Image Processing	-	-	-	-
B.Tech 17UGCSEPT	17150E54AP	Soft Computing	-	-	-	-
B.Tech 17UGCSEPT	17150E54BP	Principles of Compiler Design	-	-	-	-

B.Tech 17UGCSEPT	17150E54CP	Distributed Systems	-	-	-	-
B.Tech 17UGCSEPT	17150E54DP	Mobile Computing	-	-	-	-
M.Tech 17UGCSEFT	17248S11A	Higher Mathematics	-	-	-	-
M.Tech 17UGCSEFT	17250H12	Modern Operating System	-	-	-	-
M.Tech 17UGCSEFT	17250H13	Parallel and High Performance Computing	-	-	-	-
M.Tech 17UGCSEFT	17250H14	Adhoc and Sensor Network	-	-	-	-
M.Tech 17UGCSEFT	17250H15	Advanced Data Structures and Algorithms	-	-	-	-
M.Tech 17UGCSEFT	17250E16A	Multimedia Systems	-	-	-	-
M.Tech 17UGCSEFT	17250E16B	Genetic Algorithms	-	-	-	-
M.Tech 17UGCSEFT	17250E16C	Software Metrics	-	-	-	-
M.Tech 17UGCSEFT	17250L17	Advanced Web Technologies Lab	-	-	-	-
M.Tech 17UGCSEFT	17250CRS	Research Led Seminar	-	-	-	-
M.Tech 17UGCSEFT	17250H21	Middleware Technologies	-	-	-	-
M.Tech 17UGCSEFT	17250H22	Object Oriented Software Engineering	-	-	-	-
M.Tech 17UGCSEFT	17250H23	Digital Image Processing	-	-	-	-
M.Tech 17UGCSEFT	17250E24A	Advanced Distributed Computing	-	-	-	-
M.Tech 17UGCSEFT	17250E24B	Data Warehousing & Data Mining	-	-	-	-
M.Tech 17UGCSEFT	17250E24C	Artificial Neural Networks	-	-	-	-
M.Tech 17UGCSEFT	17250E25A	Service Oriented Architecture	-	-	-	-

M.Tech 17UGCSEFT	17250E25B	High Speed Networks	-	-	-	-
M.Tech 17UGCSEFT	17250E25C	Embedded Systems	-	-	-	-
M.Tech 17UGCSEFT	172TECWR	Technical Writing /Seminars	-	-	-	-
M.Tech 17UGCSEFT	17250CRM	Research Methodology	-	-	-	-
M.Tech 17UGCSEFT	17250CBR	Participation in Bounded Research	-	-	-	-
M.Tech 17UGCSEFT	17250H31	Software Project Management	-	-	-	✔
M.Tech 17UGCSEFT	17250E32A	Cloud Computing	-	-	-	-
M.Tech 17UGCSEFT	17250E32B	Information Security	-	-	-	-
M.Tech 17UGCSEFT	17250E32C	Soft Computing	-	-	-	-
M.Tech 17UGCSEFT	17250E33A	Advanced Database Technology	-	-	-	-
M.Tech 17UGCSEFT	17250E33B	Mobile Communication and Computing	-	-	-	-
M.Tech 17UGCSEFT	17250E33C	Green Computing	-	-	✔	-
M.Tech 17UGCSEFT	17250E34A	Software Quality Assurance	-	-	-	-
M.Tech 17UGCSEFT	17250E34B	Bio-Informatics	-	-	✔	-
M.Tech 17UGCSEFT	17250E34C	Wireless Application Protocols	-	-	-	-
M.Tech 17UGCSEFT	17250P35	Project Work- Phase I	-	-	-	-
M.Tech 17UGCSEFT	17250P35	Project Work- Phase I	-	-	-	-
M.Tech 17UGCSEFT	17250CSR	Design/Socio Technical Project	-	-	-	-
M.Tech 17UGCSEFT	17250P41	Project Work- Phase II	-	-	-	-
M.Tech 17UGCSEPT	17250H12P	Adhoc & Sensor Networks	-	-	-	-

M.Tech 17UGCSEPT	17250H13P	Advanced Data Structures	-	-	-	-
M.Tech 17UGCSEPT	17250L14P	Advanced Web Technologies Lab	-	-	-	-
M.Tech 17UGCSEPT	17250HRSP	Research Led Seminar	-	-	-	-
M.Tech 17UGCSEPT	17250H21P	Middleware Technologies	-	-	-	-
M.Tech 17UGCSEPT	17250H22P	Digital Image Processing	-	-	-	-
M.Tech 17UGCSEPT	17250E23_P	Elective I	-	-	-	-
M.Tech 17UGCSEPT	17250L24P	.NET Technologies Lab	-	-	-	-
M.Tech 17UGCSEPT	172TECWRP	Technical Writing /Seminars	-	-	-	-
M.Tech 17UGCSEPT	17250HRMP	Research Methodology	-	-	-	-
M.Tech 17UGCSEPT	17250HBRP	Participation in Bounded Research	-	-	-	-
M.Tech 17UGCSEPT	17250H31P	Modern Operating System	-	-	-	-
M.Tech 17UGCSEPT	17250E32P	Parallel and High Performance Computing	-	-	-	-
M.Tech 17UGCSEPT	17250E33_P	Elective-II	-	-	-	-
M.Tech 17UGCSEPT	17250CSRP	Object Oriented Software Engineering	-	-	-	-
M.Tech 17UGCSEPT	13250H42P	Software Project Management	-	-	-	✔
M.Tech 17UGCSEPT	13250E43_P	Elective-V	-	-	-	-
M.Tech 17UGCSEPT	13250P44P	Project Work- Phase I	-	-	-	-
M.Tech 17UGCSEPT	17250E51_P	Elective-IV	-	-	-	-
M.Tech 17UGCSEPT	17250E52_P	Elective-V	-	-	-	-
M.Tech 17UGCSEPT	17250E53_P	Elective-VI	-	-	-	-
M.Tech 17UGCSEPT	17250P61P	Project Work- Phase II*	-	-	-	-
M.Tech 17UGCSEPT	17250E23AP	Advanced Distributed Computing				

M.Tech 17UGCSEPT	17250E23BP	Data Warehousing & Data Mining	-	-	-	-
M.Tech 17UGCSEPT	17250E23CP	Artificial Neural Networks	-	-	-	-
M.Tech 17UGCSEPT	17250E33AP	Multimedia Systems	-	-	-	-
M.Tech 17UGCSEPT	17250E33BP	Genetic Algorithms	-	-	-	-
M.Tech 17UGCSEPT	17250E33CP	Software Metrics	-	-	-	-
M.Tech 17UGCSEPT	17250E43AP	Service Oriented Architecture	-	-	-	-
M.Tech 17UGCSEPT	17250E43CP	Embedded Systems	-	-	-	-
M.Tech 17UGCSEPT	17250E51AP	Cloud Computing	-	-	-	-
M.Tech 17UGCSEPT	17250E51BP	Information Security	-	-	-	-
M.Tech 17UGCSEPT	17250E51CP	Soft Computing	-	-	-	-
M.Tech 17UGCSEPT	17250E52AP	Advanced Database Technology	-	-	-	-
M.Tech 17UGCSEPT	17250E52BP	Mobile Communication Computing	-	-	-	-
M.Tech 17UGCSEPT	17250E52CP	Green Computing	-	-	✔	-
M.Tech 17UGCSEPT	17250E53AP	Software Quality Assurance	-	-	-	-
M.Tech 17UGCSEPT	17250E53CP	Bio-Informatics	-	-	✔	-
M.Tech 17UGCSEPT	17250E53CP	Wireless Application Protocols	-	-	-	-

PRIST DEEMED TO BE UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613 403 - TAMILNADU

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

B.Tech – Civil Engineering FT (R-2017)

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 Sustaina bility	Professional Ethics, Human Values and Environment and Sustainability	Gender Sensitization
B.Tech-17UGCVLFT	17147S11	Communicative English					✓			
B.Tech-17UGCVLFT	17148S12	Engineering Mathematics – I					✓			
B.Tech-17UGCVLFT	17149S13	Engineering Physics								
B.Tech-17UGCVLFT	17149S14	Engineering Chemistry								
B.Tech-17UGCVLFT	17154S15	Engineering Graphics								
B.Tech-17UGCVLFT	17147S21	Technical English (All Branches)					✓			
B.Tech-17UGCVLFT	17148S22A	Engineering Mathematics II (All Branches)					✓			
B.Tech-17UGCVLFT	17149S23D	Physics for Civil Engineering								

B.Tech-17UGCVLFT	17149S24A	Environmental Science And Engineering						✓		
B.Tech-17UGCVLFT	17153S25E	Basic Electrical And Electronics Engineering								
B.Tech-17UGCVLFT	17154S26D	Engineering Mechanics								
B.Tech-17UGCVLFT	17148S31C	Transforms and Partial Differential Equations					✓			
B.Tech-17UGCVLFT	17155C32	Engineering Geology								
B.Tech-17UGCVLFT	17155C33	Construction Materials								
B.Tech-17UGCVLFT	17155C34	Strength of Materials-I								
B.Tech-17UGCVLFT	17155C35	Fluid Mechanics								
B.Tech-17UGCVLFT	17155C36	Surveying								
B.Tech-17UGCVLFT	17148S41C	Numerical Methods					✓			
B.Tech-17UGCVLFT	17155C42	Construction Techniques and Practices								
B.Tech-17UGCVLFT	17155C43	Strength of Materials II								
B.Tech-17UGCVLFT	17155C44	Applied Hydraulic Engineering								
B.Tech-17UGCVLFT	17155C45	Concrete Technology								
B.Tech-17UGCVLFT	17155C46	Soil Mechanics								
B.Tech-17UGCVLFT	17155C51	Design of Reinforced Cement Concrete Elements								
B.Tech-17UGCVLFT	17155C52	Structural Analysis I								
B.Tech-17UGCVLFT	17155C53	Water Supply Engineering						✓		
B.Tech-17UGCVLFT	17150FE54A	Database Management Systems (CSE)					✓			
B.Tech-17UGCVLFT	17150FE54B	Cloud Computing (CSE)								
B.Tech-17UGCVLFT	17152FE54A	Basic Of Bio Medical Instrumentation (ECE)								

B.Tech-17UGCVLFT	17152FE54B	Sensor and Transducers (ECE)								
B.Tech-17UGCVLFT	17153FE54A	Industrial Nano Technology (EEE)								
B.Tech-17UGCVLFT	17153FE54B	Energy Conservation and Management (EEE)					✓			
B.Tech-17UGCVLFT	17154FE54A	Renewable Energy Sources (MECH)								
B.Tech-17UGCVLFT	17154FE54B	Automotive Systems (MECH)								
B.Tech-17UGCVLFT	17155FE54A	Air Pollution And Control Engineering					✓			
B.Tech-17UGCVLFT	17155FE54B	Geographic Information Systems								
B.Tech-17UGCVLFT	17155E55A	Digital Cadastre								
B.Tech-17UGCVLFT	17155E55B	Advanced Surveying								
B.Tech-17UGCVLFT	17155E55C	Geographic Information System								
B.Tech-17UGCVLFT	17155E55D	Geo informatics Applications for Civil Engineers								
B.Tech-17UGCVLFT	17155E55E	Total Station and GPS Surveying								
B.Tech-17UGCVLFT	17155E55F	Disaster Management					✓			
B.Tech-17UGCVLFT	17155E55G	Human Rights				✓				
B.Tech-17UGCVLFT	17155C56	Foundation Engineering								
B.Tech-17UGCVLFT	17155C61	Design of Steel Structural Elements								
B.Tech-17UGCVLFT	17155C62	Structural Analysis II								
B.Tech-17UGCVLFT	17155C63	Irrigation Engineering								
B.Tech-17UGCVLFT	17155C64	Highway Engineering								
B.Tech-17UGCVLFT	17155C65	Waste Water Engineering						✓		
B.Tech-17UGCVLFT	17155E66A	Ground Improvement Techniques								

B.Tech-17UGCVLFT	17155E66B	Introduction to soil dynamics and machine foundation								
B.Tech-17UGCVLFT	17155E66C	Rock Engineering								
B.Tech-17UGCVLFT	17155E66D	Urban planning and development								
B.Tech-17UGCVLFT	17155E66E	Air pollution and control engineering					✓			
B.Tech-17UGCVLFT	17155E66F	Intellectual property rights				✓				
B.Tech-17UGCVLFT	17155C71	Estimation , Costing & Valuation Engineering								
B.Tech-17UGCVLFT	17155C72	Railways, Airports, Docks And Harbour Engineering								
B.Tech-17UGCVLFT	17155C73	Structural Design and drawing								
B.Tech-17UGCVLFT	17150FE74A	Introduction to C Programming (CSE)								
B.Tech-17UGCVLFT	17150FE74B	Data Structures & Algorithms (CSE)								
B.Tech-17UGCVLFT	17152FE74A	Robotics (ECE)								
B.Tech-17UGCVLFT	17152FE74B	Electronic Devices (ECE)								
B.Tech-17UGCVLFT	17153FE74A	Basic Circuit Theory (EEE)								
B.Tech-17UGCVLFT	17153FE74B	Introduction to Renewable Energy Systems (EEE)								
B.Tech-17UGCVLFT	17154FE74A	Industrial Safety (MECH)								
B.Tech-17UGCVLFT	17154FE74B	Testing of Materials (MECH)								
B.Tech-17UGCVLFT	17155E75A	Pavement Engineering								
B.Tech-17UGCVLFT	17155E75B	Traffic engineering and management					✓			
B.Tech-17UGCVLFT	17155E75C	Transport and Environment						✓		
B.Tech-17UGCVLFT	17155E75D	Industrial Structures								

B.Tech-17UGCVLFT	17155E75E	Environmental and social impact assessment						✓		
B.Tech-17UGCVLFT	17155E75F	Design of Prestressed concrete structures								
B.Tech-17UGCVLFT	17155E75G	Construction planning and scheduling								
B.Tech-17UGCVLFT	17155E75H	Municipal solid waste management					✓			
B.Tech-17UGCVLFT	17160E75I	Total quality management					✓			
B.Tech-17UGCVLFT	17155E81A	Coastal Engineering								
B.Tech-17UGCVLFT	17155E81B	Participatory water resources management					✓			
B.Tech-17UGCVLFT	17155E81C	Integrated water resources management					✓			
B.Tech-17UGCVLFT	17155E81D	Groundwater engineering						✓		
B.Tech-17UGCVLFT	17155E81E	Water resources system systems engineering						✓		
B.Tech-17UGCVLFT	17155E81F	Geo-environmental engineering						✓		
B.Tech-17UGCVLFT	17155E81G	Hydrology and water resources engineering						✓		
B.Tech-17UGCVLFT	17155E81H	Professional ethics in engineering					✓			
B.Tech-17UGCVLFT	17155E82A	Computer aided design of structures								
B.Tech-17UGCVLFT	17155E82B	Maintenance, repair and rehabilitation of structures								
B.Tech-17UGCVLFT	17155E82C	Structural dynamics and earthquake engineering								
B.Tech-17UGCVLFT	17155E82D	Prefabricated structures								
B.Tech-17UGCVLFT	17155E82E	Bridge engineering								
B.Tech-17UGCVLFT	17155E82F	Foundation of nano science								
B.Tech-17UGCVLFT	17155PW83	Project Work								
B.Tech-17UGCVLFT	17155COM	COMPS								

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

B.Tech – Civil Engineering PT (R-2017)

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-17UGCVLPT	17148S11P	Transforms & Partial Differential Equations					✓			
B.Tech-17UGCVLPT	17155H12P	Mechanics of Solids								
B.Tech-17UGCVLPT	17155H13P	Fluid Mechanics I								
B.Tech-17UGCVLPT	17155H14P	Surveying								
B.Tech-17UGCVLPT	17155H15P	Irrigation Engineering						✓		
B.Tech-17UGCVLPT	17148S21P	Numerical Methods					✓			
B.Tech-17UGCVLPT	17155H22P	Strength of Materials								

B.Tech-17UGCVLPT	17155H23P	Fluid Mechanics II								
B.Tech-17UGCVLPT	17155H24P	Concrete Technology								
B.Tech-17UGCVLPT	17155H25P	Soil Mechanics								
B.Tech-17UGCVLPT	17148S31P	Probability & Statistics					✓			
B.Tech-17UGCVLPT	17155H32P	Design of Reinforced Concrete Structures-I								
B.Tech-17UGCVLPT	17155H33P	Structural Analysis I								
B.Tech-17UGCVLPT	17155H34P	Construction Materials And Practice								
B.Tech-17UGCVLPT	17155H41P	Design of Reinforced Concrete Structures-II								
B.Tech-17UGCVLPT	17155H42P	Structural Analysis II								
B.Tech-17UGCVLPT	17155H43P	Environmental Engineering						✓		
B.Tech-17UGCVLPT	17155E44AP	Hydrology								
B.Tech-17UGCVLPT	17155E44BP	Water Resource Engineering								
B.Tech-17UGCVLPT	17155E44CP	Building Technology								
B.Tech-17UGCVLPT	17155E44DP	Contract Laws And Regulations								
B.Tech-17UGCVLPT	17155H51P	Design of Steel Structures								
B.Tech-17UGCVLPT	17155H52P	Foundation Engineering								
B.Tech-17UGCVLPT	17155H53P	Industrial Waste Management					✓			
B.Tech-17UGCVLPT	17155E54AP	Computer Aided Analysis And Design								
B.Tech-17UGCVLPT	17155E54BP	Transportation Engineering								

B.Tech-17UGCVLPT	17155E54CP	Geology								
B.Tech-17UGCVLPT	17155E54DP	Highway Engineering								
B.Tech-17UGCVLPT	17155H61P	Estimation & Cost Evaluation								
B.Tech-17UGCVLPT	17155H62P	Ground Water Hydrology						✓		
B.Tech-17UGCVLPT	17155H63P	Construction Project Management					✓			
B.Tech-17UGCVLPT	17155E64AP	Remote Sensing And GIS								
B.Tech-17UGCVLPT	17155E64BP	Railway Engineering								
B.Tech-17UGCVLPT	17155E64CP	Airport & Harbours								
B.Tech-17UGCVLPT	17155E64DP	Electronic Surveying								
B.Tech-17UGCVLPT	17160S71P	Total Quality Management					✓			
B.Tech-17UGCVLPT	17155H72P	Housing, Planning & Management					✓			
B.Tech-17UGCVLPT	17155H73P	Repair And Rehabilitation of Structures								
B.Tech-17UGCVLPT	17155E74AP	Air Pollution Management					✓			
B.Tech-17UGCVLPT	17155E74BP	Pre Fabricated Structures								
B.Tech-17UGCVLPT	17155E74CP	Bridge Structures								
B.Tech-17UGCVLPT	17155E74DP	Prestressed Concrete Structures								
B.Tech-17UGCVLPT	17155P75P	Project Work								

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

M.Tech – Structural Engineering FT (R-2017)

Programme Name &Code	Course Code	Title of the Course	CrossCuttingIssues							
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainability and Human Values	Hu man Values	Professional Ethics	Environment and Sustainability	Professional Ethics, Human Values and Environment and Sustainability	Gender Sensitization
M.Tech-17PGSTEFT	17248S11E	Advanced Engineering Mathematics					✓			
M.Tech-17PGSTEFT	17255H12	Quality Control &Assurance in Construction								
M.Tech-17PGSTEFT	17255H13	Theory of Plasticity and Elasticity								
M.Tech-17PGSTEFT	17255H14	Structural Dynamics								
M.Tech-17PGSTEFT	17255H15	Maintenance and Rehabilitation of Structures								
M.Tech-17PGSTEFT	17255E16A	Prestressed Concrete Design								
M.Tech-	17255E16B	High Rise								

17PGSTEFT		Structures								
M.Tech-17PGSTEFT	17255E16C	Computer Aided Structural Design								
M.Tech-17PGSTEFT	17255H21	Management Information System					✓			
M.Tech-17PGSTEFT	17255H22	Finite Element Analysis								
M.Tech-17PGSTEFT	17255H23	Advanced Concrete Structural Design								
M.Tech-17PGSTEFT	17255E24A	Failure Analysis of Structures								
M.Tech-17PGSTEFT	17255E24B	Advanced Concrete Technology								
M.Tech-17PGSTEFT	17255E24 C	Steel, Concrete Composite Structures								
M.Tech-17PGSTEFT	17255E25A	Optimization in Structural Design								
M.Tech-17PGSTEFT	17255E25B	Design of Industrial Structures								
M.Tech-17PGSTEFT	17255E25 C	Elements of Earthquake Engineering								
M.Tech-17PGSTEFT	17255H31	Advanced Steel Structures								
M.Tech-17PGSTEFT	17255E32A	ExperimentalStressAnalysis								
M.Tech-17PGSTEFT	17255E32B	Soil Structure Interaction								
M.Tech-17PGSTEFT	17255E32C	Aseismic Design of Structures								
M.Tech-17PGSTEFT	17255E33A	Prefabricated Structures								
M.Tech-17PGSTEFT	17255E33B	Disaster Resistant Structures								

M.Tech-17PGSTEFT	17255E33C	Nonlinear Analysis of Structures								
M.Tech-17PGSTEFT	17255E34A	Offshore Structures								
M.Tech-17PGSTEFT	17255E34B	Stability of Structures								
M.Tech-17PGSTEFT	17255E34C	Mechanics of Composite Materials								
M.Tech-17PGSTEFT	17255P35	Project Work Phase-I								
M.Tech-17PGSTEFT	17255CSR	Design Project / Socio - Technical Project								
M.Tech-17PGSTEFT	17255P41	Project Work Phase-II								

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

M.Tech – Structural Engineering PT (R-2017)

Programme Name & Code	Course Code	Title of the Course	CrossCuttingIssues							
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainability and Human Values	Hu man Values	Professional Ethics	Environment and Sustainability	Professional Ethics, Human Values and Environment and Sustainability	Gender Sensitization
M.Tech-17PGSTEPT	17248S11EP	AdvancedEngineeringMathematics					✓			
M.Tech-17PGSTEPT	17255C12P	QualityControl &AssuranceinConstruction								
M.Tech-17PGSTEPT	17255C13P	TheoryofPlasticityandElasticity								
M.Tech-17PGSTEPT	17255C21P	ManagementInformationSystem					✓			
M.Tech-17PGSTEPT	17255C22P	FiniteElementAnalysis								
M.Tech-17PGSTEPT	17255E23AP	Failure Analysis ofStructures								
M.Tech-17PGSTEPT	17255E23BP	AdvancedConcreteTechnology								

M.Tech-17PGSTEPT	17255E23CP	Steel,Concrete CompositeStructures									
M.Tech-17PGSTEPT	17255C31P	StructuralDynamics									
M.Tech-17PGSTEPT	17255C32P	Maintenanceand RehabilitationofStructures									
M.Tech-17PGSTEPT	17255E33AP	PrestressedConcreteDesign									
M.Tech-17PGSTEPT	17255E33BP	HighRise Structures									
M.Tech-17PGSTEPT	17255E33CP	Computer AidedStructural Design									
M.Tech-17PGSTEPT	17255C41P	Advanced Concrete Structuraldesign									
M.Tech-17PGSTEPT	17255C42P	AdvancedSteel Structures									
M.Tech-17PGSTEPT	17255E43AP	OptimizationIn StructuralDesign									
M.Tech-17PGSTEPT	17255E43BP	Design OfIndustrialStructures									
M.Tech-17PGSTEPT	17255E43CP	ElementsOfEarthquakeEngineering									
M.Tech-17PGSTEPT	17255P44P	ProjectWorkPhaseI									
M.Tech-17PGSTEPT	17255E51AP	ExperimentalStressAnalysis									
M.Tech-17PGSTEPT	17255E51BP	SoilStructureInteraction									
M.Tech-17PGSTEPT	17255E51CP	AseismicDesignOfStructures									
M.Tech-17PGSTEPT	17255E52AP	PrefabricatedStructures									
M.Tech-17PGSTEPT	17255E52BP	DisasterResistantStructures									

M.Tech-17PGSTEPT	17255E52CP	NonlinearAnalysisofStructures								
M.Tech-17PGSTEPT	17255E53AP	OffshoreStructures								
M.Tech-17PGSTEPT	17255E53BP	StabilityOfStructures								
M.Tech-17PGSTEPT	17255E53CP	MechanicsOfCompositeMaterials								
M.Tech-17PGSTEPT	17255P61P	ProjectWorkPhaseII								

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 R2017

I - VIII SEMESTERS CURRICULUM AND SYLLABI

B.TECH (FT) CIVIL [Regulation 2017] **SEMESTER I**

Sl.No	Course Code	Course Title	Periods Per Week			Credit
	THEORY		L	T	P	
1	17147S11	Communicative English	5	1	0	4
2	17148S12	Engineering Mathematics – I	5	1	0	4
3	17149S13	Engineering Physics	5	1	0	4
4	17149S14	Engineering Chemistry	5	1	0	4
5	17154S15	Engineering Graphics	5	1	0	4
6	17150S16	Problem Solving and Python Programming	5	1	0	4
PRACTICALS						
7	17150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8	17149L18	Physics and Chemistry Laboratory	0	0	3	2
9	171VEA19	Value Education				1
	TOTAL					29

SEMESTER II

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17147S21	Technical English (All Branches)	5	1	0	4
2.	17148S22A	Engineering Mathematics II (All Branches)	5	1	0	4
3.	17149S23D	Physics for Civil Engineering	5	1	0	4
4.	17149S24A	Environmental Science And Engineering	5	1	0	4
5.	17153S25E	Basic Electrical And Electronics Engineering	5	1	0	4
6.	17154S26D	Engineering Mechanics	5	1	0	4
PRACTICALS						
7.	17154L27	Engineering Practices Laboratory	0	0	4	2

8.	17155L28E	Computer Aided Building Drawing Lab	0	0	4	2
9.	171ICA29	Fundamentals of Indian Constitution and Economy	0	0	0	1
		TOTAL	**21**	**0**	**8**	**29**

SEMESTER III

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	17148S31C	Transforms and Partial Differential Equations	4	0	0	4
2	17155C32	Engineering Geology	4	0	0	4
3	17155C33	Construction Materials	4	0	0	4
4	17155C34	Strength of Materials-I	4	0	0	4
5	17155C35	Fluid Mechanics	4	0	0	3
6	17155C36	Surveying	4	0	0	3
PRACTICALS						
7	17155L37	Surveying Laboratory	0	0	3	2
8	17155L38	Construction Materials Laboratory	0	0	3	2
9	17155L39	Interpersonal Skills / Listening and Speaking	0	0	2	1
		TOTAL				27

SEMESTER IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	17148S41C	Numerical Methods	4	0	0	4
2	17155C42	Construction Techniques and Practices	3	0	0	3
3	17155C43	Strength of Materials II	4	0	0	4
4	17155C44	Applied Hydraulic Engineering	4	0	0	4
5	17155C45	Concrete Technology	3	0	0	3
6	17155C46	Soil Mechanics	3	0	0	3
PRACTICALS						

7	17155L47	Strength of Materials Lab	0	0	3	2
8	17155L48	Hydraulic Engineering Lab	0	0	3	2
9	17155L49	Advanced Reading & Writing	0	0	2	1
10	17155CRS	Research Led Seminar	0	0	2	1
		TOTAL				27

SEMESTER – V

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	17155C51	Design of Reinforced Cement Concrete Elements	4	0	0	4
2	17155C52	Structural Analysis I	3	0	0	3
3	17155C53	Water Supply Engineering	4	0	0	4
4	17155FE54	Free Elective I	3	0	0	3
5	17155E55	Elective I	3	0	0	3
6	17155C56	Foundation Engineering	3	0	0	3
PRACTICALS						
7	17155L57	Soil Mechanics Lab	0	0	3	2
8	17155L58	Water and Waste Water Analysis Lab	0	0	3	2
9	17155L59	Survey Camp	0	0	2	2
10	17155CRM	Research Methodology	0	0	2	3
		TOTAL				29

SEMESTER – VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	17155C61	Design of Steel Structural Elements	3	0	0	3
2	17155C62	Structural Analysis II	4	0	0	4
3	17155C63	Irrigation Engineering	3	0	0	3
4	17155C64	Highway Engineering	3	0	0	3
5	17155C65	Waste Water Engineering	3	0	0	3
6	17155E66	Elective II	3	0	0	3
PRACTICALS						

7	17155L67	Highway Engineering Laboratory	0	0	3	2
8	17155L68	Irrigation and Environmental Engineering Drawing	0	0	3	2
9	17155L69	Professional Communication	0	0	2	2
10	17155CBR	Participation in Bounded Research	0	0	2	2
		TOTAL				27

SEMESTER – VII

S. No	Sub. Code	Name of the Subject	L	T	P	C
THEORY						
1	17155C71	Estimation , Costing & Valuation Engineering	4	0	0	3
2	17155C72	Railways, Airports, Docks And Harbour Engineering	4	0	0	3
3	17155C73	Structural Design and drawing	4	0	0	4
4	17155FE74	Free Elective II	4	0	0	3
5	17155E75	Elective III	4	0	0	4
PRACTICALS						
6	17155L76	Creative and Innovation project (activity based –subject related)	0	0	4	2
7	17155L77	Industrial Training (4 Weeks during VI th Sem Summar)	0	0	0	2
8	17155L78	Technical Seminar	0	0	2	1
9	17155CSR	Design / Socio - Technical Project(Participated Scaffolded Research)	0	0	4	4
		TOTAL				26

SEMESTER – VIII

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E81	Elective IV	4	0	0	3
2	17155E82	Elective V	4	0	0	3
3	17155PW83	Project Work	0	0	20	10
4	17155COM	COMPS	0	0	2	2
TOTAL						18

LIST OF ELECTIVES

SEMESTER – V

ELECTIVE I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E55A	Digital Cadastre	4	1	0	3
2	17155E55B	Advanced Surveying	4	1	0	3
3	17155E55C	Geographic Information System	4	1	0	3
4	17155E55D	Geo informatics Applications for Civil Engineers	4	1	0	3
5	17155E55E	Total Station and GPS Surveying	4	1	0	3
6	17155E55F	Disaster Management	4	1	0	3
7	17155E55G	Human Rights	4	1	0	3

SEMESTER – VI

ELECTIVE II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E66A	Ground Improvement Techniques	4	1	0	3
2	17155E66B	Introduction to soil dynamics and machine foundation	4	1	0	3
3	17155E66C	Rock Engineering	4	1	0	3
4	17155E66D	Urban planning and development	4	1	0	3
5	17155E66E	Air pollution and control engineering	4	1	0	3
6	17155E66F	Intellectual property rights	4	1	0	3

SEMESTER – VII

ELECTIVE III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E75A	Pavement Engineering	3	1	0	4
2	17155E75B	Traffic engineering and management	3	1	0	4
3	17155E75C	Transport and Environment	3	1	0	4
4	17155E75D	Industrial Structures	3	1	0	4
5	17155E75E	Environmental and social impact assessment	3	1	0	4
6	17155E75F	Design of Prestressed concrete structures	3	1	0	4
7	17155E75G	Construction planning and scheduling	3	1	0	4
8	17155E75H	Municipal solid waste management	3	1	0	4
9	17160E75I	Total quality management	3	1	0	4

SEMESTER – VIII

ELECTIVE IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E81A	Coastal Engineering	4	1	0	3
2	17155E81B	Participatory water resources management	4	1	0	3
3	17155E81C	Integrated water resources management	4	1	0	3
4	17155E81D	Groundwater engineering	4	1	0	3
5	17155E81E	Water resources system systems engineering	4	1	0	3
6	17155E81F	Geo-environmental engineering	4	1	0	3
7	17155E81G	Hydrology and water resources engineering	4	1	0	3
8	17155E81H	Professional ethics in engineering	4	1	0	3

ELECTIVE V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E82A	Computer aided design of structures	4	1	0	3
2	17155E82B	Maintenance, repair and rehabilitation of structures	4	1	0	3
3	17155E82C	Structural dynamics and earthquake engineering	4	1	0	3
4	17155E82D	Prefabricated structures	4	1	0	3
5	17155E82E	Bridge engineering	4	1	0	3
6	17155E82F	Foundation of nano science	4	1	0	3

FREE ELECTIVE-I

1	17150FE54A	Database Management Systems (CSE)	3	0	0	3
2	17150FE54B	Cloud Computing (CSE)	3	0	0	3
3	17152FE54A	Basic Of Bio Medical Instrumentation (ECE)	3	0	0	3
4	17152FE54B	Sensor and Transducers (ECE)	3	0	0	3
5	17153FE54A	Industrial Nano Technology (EEE)	3	0	0	3
6	17153FE54B	Energy Conservation and Management (EEE)	3	0	0	3
7	17154FE54A	Renewable Energy Sources (MECH)	3	0	0	3
8	17154FE54B	Automotive Systems (MECH)	3	0	0	3
9	17155FE54A	Air Pollution And Control Engineering	3	0	0	3
10	17155FE54B	Geographic Information Systems	3	0	0	3

FREE ELECTIVE-II

1	17150FE74A	Introduction to C Programming (CSE)	**3**	**0**	**0**	**3**
2	17150FE74B	Data Structures & Algorithms (CSE)	**3**	**0**	**0**	**3**
3	17152FE74A	Robotics (ECE)	**3**	**0**	**0**	**3**
4	17152FE74B	Electronic Devices (ECE)	**3**	**0**	**0**	**3**
5	17153FE74A	Basic Circuit Theory (EEE)	**3**	**0**	**0**	**3**
6	17153FE74B	Introduction to Renewable Energy Systems (EEE)	**3**	**0**	**0**	**3**
7	17154FE74A	Industrial Safety (MECH)	**3**	**0**	**0**	**3**
8	17154FE74B	Testing of Materials (MECH)	**3**	**0**	**0**	**3**

COURSE STRUCTURE

B.TECH PT CIVIL R2017

SEMESTER – I

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17148S11P	Transforms & Partial Differential Equations	S	2	1	0	4
2	17155H12P	Mechanics of Solids	H	3	1	0	4
3	17155H13P	Fluid Mechanics I	H	3	1	0	4
4	17155H14P	Surveying	H	3	1	0	4
5	17155H15P	Irrigation Engineering	H	3	0	0	3
TOTAL							19

SEMESTER – II

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17148S21P	Numerical Methods	S	3	1	0	4
2	17155H22P	Strength of Materials	H	3	1	0	4
3	17155H23P	Fluid Mechanics II	H	3	1	0	4
4	17155H24P	Concrete Technology	H	3	1	0	4
5	17155H25P	Soil Mechanics	H	3	1	0	3
TOTAL							19

SEMESTER – III

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17148S31P	Probability & Statistics	S	3	1	0	4
2	17155H32P	Design of Reinforced Concrete Structures-I	H	3	1	0	4
3	17155H33P	Structural Analysis I	H	3	1	0	4
4	17155H34P	Construction Materials And Practice	H	3	1	0	3
5	17155L35P	Soil Mechanics laboratory	-	0	0	3	2
TOTAL							17

SEMESTER – IV

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17155H41P	Design of Reinforced Concrete Structures-II	H	3	1	0	4
2	17155H42P	Structural Analysis II	H	3	1	0	4
3	17155H43P	Environmental Engineering	H	3	1	0	4
4	17155E44-P	Hard Core Elective I	-	3	1	0	4
5	17155L45P	Environmental Engineering Lab	-	0	0	3	2
TOTAL							18

SEMESTER – V

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17155H51P	Design of Steel Structures	H	3	1	0	4
2	17155H52P	Foundation Engineering	H	3	1	0	4
3	17155H53P	Industrial Waste Management	H	3	1	0	4
4	17155E54-P	Hard Core Elective II	-	3	1	0	4
5	17155L55P	Computer Aided Building Drawing Laboratory	L	0	0	3	2
							18

SEMESTER – VI

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17155H61P	Estimation & Cost Evaluation	H	3	1	0	4
2	17155H62P	Ground Water Hydrology	H	3	1	0	4
3	17155H63P	Construction Project Management	H	3	1	0	4
4	17155E64-P	Hard Core Elective III	-	3	1	0	4
5	17155L65P	Concrete &Transportation Engineering Laboratory	L	0	0	3	2
TOTAL							18

SEMESTER – VII

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	17160S71P	Total Quality Management	S	3	0	0	3
2	17155H72P	Housing, Planning & Management	H	3	1	0	4
3	17155H73P	Repair And Rehabilitation of Structures	H	3	1	0	4
4	17155E74-P	Hard Core Elective IV	-	3	1	0	4
5	17155P75P	Project Work	-	-	-	12	6
TOTAL							21

LIST OF ELECTIVES

HARD CORE ELECTIVE I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E44AP	Hydrology	3	1	0	4
2	17155E44BP	Water Resource Engineering	3	1	0	4
3	17155E44CP	Building Technology	3	1	0	4
4	17155E44DP	Contract Laws And Regulations	3	1	0	4

HARD CORE ELECTIVE II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E54AP	Computer Aided Analysis And Design	3	1	0	4
2	17155E54BP	Transportation Engineering	3	1	0	4
3	17155E54CP	Geology	3	1	0	4
4	17155E54DP	Highway Engineering	3	1	0	4

HARD CORE ELECTIVE III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E64AP	Remote Sensing And GIS	3	1	0	4
2	17155E64BP	Railway Engineering	3	1	0	4
3	17155E64CP	Airport & Harbours	3	1	0	4
4	17155E64DP	Electronic Surveying	3	1	0	4

HARD CORE ELECTIVE IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17155E74AP	Air Pollution Management	3	1	0	4
2	17155E74BP	Pre Fabricated Structures	3	1	0	4
3	17155E74CP	Bridge Structures	3	1	0	4
4	17155E74DP	Prestressed Concrete Structures	3	1	0	4

COURSE STRUCTURE

M.TECH FT STRUCTURAL R2017

SEMESTER – I

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17248S11E	Advanced Engineering Mathematics	3	1	0	4
2	17255H12	Quality Control &Assurance in Construction	3	1	0	4
3	17255H13	Theory of Plasticity and Elasticity	3	1	0	4
4	17255H14	Structural Dynamics	3	1	0	4
5	17255H15	Maintenance and Rehabilitation of Structures	3	1	0	4
6	17255E16(A-C)	Hard Core Elective I	3	1	0	4
7	17255L17	Core Practical (Computer Programming Lab)	0	0	3	3
8	17255CRS	Research Led Seminar	4	0	0	1
		TOTAL				28

SEMESTER – II

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255H21	Management Information System	3	1	0	4
2	17255H22	Finite Element Analysis	3	1	0	4
3	17255H23	Advanced Concrete Structural Design	3	1	0	4
4	17255E24(A-C)	Hard Core Elective –II	3	1	0	4
5	17255E25(A-C)	Hard Core Elective –III	3	1	0	4
6	17255L26	Core practical(Software Lab – Finite Element Analysis-ANSYS)	0	0	3	3
7	172TECWR	Technical writing / Seminars	0	0	3	3
8	17255CRM	Research Methodology	4	0	0	3
9	17255CBR	Participation in Bounded Research	1	0	0	2
		TOTAL				31

SEMESTER – III

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255H31	Advanced Steel Structures	3	1	0	4
2	17255E32(A-C)	Hard Core Elective IV	3	1	0	4
3	17255E33(A-C)	Hard Core Elective V	3	1	0	4
4	17255E34(A-C)	Hard Core Elective VI	3	1	0	4
6	17255P35	Project Work Phase-I	0	0	6	6
7	17255CSR	Design Project / Socio -Technical Project	4	0	0	4
		TOTAL				26

SEMESTER – IV

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255P41	Project Work Phase-II	0	0	12	12
		TOTAL				12

LIST OF ELECTIVES

SEMESTER I

Hard Core Elective-I

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E16A	Prestressed Concrete Design	3	1	0	4
2	17255E16B	High Rise Structures	3	1	0	4
3	17255E16C	Computer Aided Structural Design	3	1	0	4

SEMESTER II

Hard Core Elective - II

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E24 A	Failure Analysis of Structures	3	1	0	4
2	17255E24 B	Advanced Concrete Technology	3	1	0	4
3	17255E24 C	Steel, Concrete Composite Structures	3	1	0	4

Hard Core Elective - III

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E25A	Optimization in Structural Design	3	1	0	4
2	17255E25B	Design of Industrial Structures	3	1	0	4
3	17255E25 C	Elements of Earthquake Engineering	3	1	0	4

SEMESTER III

Hard Core Elective-IV

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E32A	Experimental Stress Analysis	3	1	0	4
2	17255E32B	Soil Structure Interaction	3	1	0	4
3	17255E32C	Aseismic Design of Structures	3	1	0	4

Hard Core Elective – V

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E33A	Prefabricated Structures	3	1	0	4
2	17255E33B	Disaster Resistant Structures	3	1	0	4
3	17255E33C	Nonlinear Analysis of Structures	3	1	0	4

Hard Core Elective – VI

S. No	Subject Code	Name of the Subject	L	T	P	C
1	17255E34A	Offshore Structures	3	1	0	4
2	17255E34B	Stability of Structures	3	1	0	4
3	17255E34C	Mechanics of Composite Materials	3	1	0	4

COURSE STRUCTURE

M.TECH PT STRUCTURAL R2017

SEMESTER – I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17248S11EP	Advanced Engineering Mathematics	3	1	0	4
2	17255C12P	Quality Control &Assurance in Construction	3	1	0	4
3	17255C13P	Theory of Plasticity and Elasticity	3	1	0	4
4	17255L14P	Computer Programming Lab	0	0	3	3
5	17255CRSP	Research Led Seminar	4	0	0	1
TOTAL						16

SEMESTER – II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255C21P	Management Information System	3	1	0	4
2	17255C22P	Finite Element Analysis	3	1	0	4
3	17255E23-P	Elective I-(ACT)	3	1	0	4
4	17255L24P	Software Lab – ANSYS	0	0	3	3
5	172TECWRP	Technical Writing / Seminars	0	0	3	3
6	17255CRMP	Research Methodology	4	0	0	3
7	17255CBRP	Participation in Bounded Research	1	0	0	2
TOTAL						23

SEMESTER – III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255C31P	Structural Dynamics	3	1	0	4
2	17255C32P	Maintenance and Rehabilitation of Structures	3	1	0	4
3	17255E33-P	Elective II	3	1	0	4
TOTAL						16

SEMESTER – IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255C41P	Advanced Concrete Structural design	3	1	0	4
2	17255C42P	Advanced Steel Structures	3	1	0	4
3	17255E43-P	Elective III	3	1	0	4
4	17255P44P	Project Work Phase I	0	0	6	6
5	17255CSRP	Design / Socio -Technical Project	4	0	0	4
Total Credits						18

SEMESTER – V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E51-P	Elective IV	3	1	0	4
2	17255E52-P	Elective V	3	1	0	4
3	17255E53-P	Elective VI	3	1	0	4
TOTAL						12

SEMESTER – VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255P61P	Project Work Phase II	0	0	12	12
Total Credits						12

LIST OF ELECTIVES
SEMESTER II
Elective-I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E23AP	Failure Analysis of Structures	3	1	0	4
2	17255E23BP	Advanced Concrete Technology	3	1	0	4
3	17255E23CP	Steel, Concrete Composite Structures	3	1	0	4

SEMESTER III
Elective - II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E33AP	Prestressed Concrete Design	3	1	0	4
2	17255E33BP	High Rise Structures	3	1	0	4
3	17255E33CP	Computer Aided Structural Design	3	1	0	4

SEMESTER IV

Elective - III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E43AP	Optimization In Structural Design	3	1	0	4
2	17255E43BP	Design Of Industrial Structures	3	1	0	4
3	17255E43CP	Elements Of Earthquake Engineering	3	1	0	4

SEMESTER V

Elective-IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E51AP	Experimental Stress Analysis	3	1	0	4
2	17255E51BP	Soil Structure Interaction	3	1	0	4
3	17255E51CP	A seismic Design Of Structures	3	1	0	4

Elective – V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E52AP	Prefabricated Structures	3	1	0	4
2	17255E52BP	Disaster Resistant Structures	3	1	0	4
3	17255E52CP	Nonlinear Analysis of Structures	3	1	0	4

Elective - VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	17255E53AP	Offshore Structures	3	1	0	4
2	17255E53BP	Stability Of Structures	3	1	0	4
3	17255E53CP	Mechanics Of Composite Materials	3	1	0	4

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 2017]

COURSE STRUCTURE

B.E. MECHANICAL ENGINEERING

REGULATIONS – 2017

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 2017] **SEMESTER I**

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17147S11	Communicative English	5	1	0	4
2.	17148S12	Engineering Mathematics - I	5	1	0	4
3.	17149S13	Engineering Physics	5	1	0	4
4.	17149S14	Engineering Chemistry	5	1	0	4
5.	17154S15	Engineering Graphics	5	1	0	4
6.	17150S16	Problem Solving and Python Programming	5	1	0	4
PRACTICAL						
7.	17150L17	Problem Solving and Python Programming Laboratory	0	0	3	2
8.	17149L18	Physics and Chemistry Laboratory	0	0	3	2
9.	171VEA19	Value Education				1
TOTAL			30	**6**	**6**	**29**

SEMESTER II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17147S21	Technical English (All Branches	5	1	0	4
2.	17148S22	Engineering Mathematics II (All Branches)	5	1	0	4
3	17149S23C	Material Science (MECH)	5	1	0	4
4.	17149S24A	Environmental Science And Engineering (CSE, EEE, MECH, CIVIL)	5	1	0	4
5.	17153S25D	Basic Electrical, Electronics And Instrumentation Engineering (MECH)	5	1	0	4
6.	17154S26D	Engineering Mechanics (MECH,CIVIL)	5	1	0	4
PRACTICAL						
7.	17154L27	Engineering Practices Lab . (All Branches)	0	0	3	2
8.	17153L28D	Basic Electrical, Electronics and Instrumentation Engineering Lab (Mech)	0	0	3	2
9.	171ICA29	Fundamentals of Indian constitution and Economy				1
TOTAL			**30**	**6**	**6**	**29**

SEMESTER III

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17148C31C	Transforms and Partial Differential Equations	4	0	0	4
2.	17154C32	Engineering Thermodynamics	3	2	0	4
3.	17154C33	Fluid Mechanics and Machinery	4	0	0	4
4.	17154C34	Production Technology - I	3	0	0	3
5.	17154C35	Electrical Drives and Controls	3	0	0	3
PRACTICAL						
6.	17154L36	Production Technology Laboratory - I	0	0	3	2
7.	17154L37	Computer Aided Machine Drawing	0	0	3	2
8.	17154L38	Electrical Engineering Laboratory	0	0	3	2
9.	17154L39	Interpersonal Skills / Listening & Speaking	0	0	2	1
TOTAL			**17**	**2**	**11**	**25**

SEMESTER
IV

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17148S41D	Statistics and Numerical Methods	4	0	0	4
2.	17154C42	Theory of Machines-I	3	0	0	3
3.	17154C43	Production Technology – II	3	0	0	3
4.	17154C44	Engineering Metallurgy	3	0	0	3
5.	17154C45	Strength of Meterials for Mechanical Engineers	3	0	0	3
6.	17154C46	Thermal Engineering- I	3	0	0	3
PRACTICAL						
7.	17154L47	Production Technology Laboratory - II	0	0	3	2
8.	17154L48	Strength of Materials and Fluid Mechanics and Machinery Laboratory	0	0	3	2
9.	17154L49	Advanced Reading and Writing	0	0	2	1
10.	17154CRS	Research Led Seminar				1
TOTAL			**19**	**0**	**8**	**25**

SEMESTER V

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17154C51	Thermal Engineering- II	3	0	0	3
2.	17154C52	Design of Machine Elements	3	0	0	3
3.	17154C53	Metrology and Measurements	3	0	0	3
4.	1715_FE54_	Free Elective I	3	0	0	3
5.	17154C55	Theory of Machines-II	4	2	0	4
PRACTICAL						
6.	17154L56	Theory of Machines Laboratory	0	0	3	2
7.	17154L57	Thermal Engineering Laboratory	0	0	3	2
8.	17154L58	Metrology and Measurements Laboratory	0	0	3	2
9.	17154CRM	Research Methodology	3	0	0	3
TOTAL			**19**	**2**	**9**	**25**

SEMESTER VI

S.NO	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17154C61	Design of Transmission Systems	3	0	0	3
2.	17154C62	Computer Aided Design And Manufacturing	3	0	0	3
3	17154C63	Heat and Mass Transfer	3	2	0	4
4	17154C64	Finite Element Analysis	3	0	0	3
5	17154C65	Hydraulics And Pneumatics	3	0	0	3
6	17154E66_	Elective - I	3	0	0	3
PRACTICAL						
6.	17154L67	CAD / CAM Laboratory	0	0	3	2
7.	17154L68	Design and Fabrication Project	0	0	3	2
8.	17154L69	Professional Communication	0	0	2	1
9.	17154CBR	Participation in Bounded Research				2
TOTAL			**18**	**2**	**8**	**26**

SEMESTER VII

S.No.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17154C71	Power Plant Engineering	3	0	0	3
2.	17154C72	Process Planning and Cost Estimation	3	0	0	3
3	17154C73	Mechatronics	3	0	0	3
4	1715_FE74__	Free Elective II	3	0	0	3
5	17154E75-	Elective II	3	0	0	3
6	17154E76_	Elective III	3	0	0	3
PRACTICAL						
7	17154L77	Simulation and Analysis Laboratory	0	0	3	2
8	17154L78	Mechatronics Laboratory	0	0	3	2
9	17154L79	Technical Seminar	0	0	2	1
10	17154CSR	(Design Project /SOCIO Technical Project)				4
11.	17154COM	COMPS				2
TOTAL			**18**	**0**	**8**	**29**

SEMESTER VIII

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	17154C81	Principles of Management	3	0	0	3
2	17154E82_	Elective– IV	3	0	0	3
PRACTICAL						
3.	17154PW83	Project Work	0	0	20	10
TOTAL			**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 202

ELECTIVE – I (VI SEMESTER)

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17154E66A	Automobile Engineering	3	0	0	3
2.	17154E66B	Welding Technology	3	0	0	3
3.	17154E66C	Gas Dynamics and Jet Propulsion	3	0	0	3
4.	17154E66D	Intellectual Property Rights	3	0	0	3
5.	17154E66E	Fundamentals of Nano Science	3	0	0	3
6.	17154E66F	Mechanical Vibration	3	0	0	3

ELECTIVE – II (VII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17154E74A	Refrigeration and Air conditioning	3	0	0	3
2.	17154E74B	Renewable Sources of Energy	3	0	0	3
3.	17154E74C	Quality Control and Reliability Engineering	3	0	0	3
4.	17154E74D	Unconventional Machining Processes	3	0	0	3
5.	17154E74E	Operations Research	3	0	0	3
6.	17154E74F	Additive Manufacturing	3	0	0	3
7.	17154E74G	Total Quality Management	3	0	0	3
8.	17154E74H	Automation In Manufacturing	3	0	0	3

ELECTIVE – III (VII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17154E76A	Robotics	3	0	0	3
2.	17154E76B	Design of Jigs, Fixtures and Press Tools	3	0	0	3
3.	17154E76C	Computational Fluid Dynamics	3	0	0	3
4.	17154E76D	Non Destructive Testing and Evaluation	3	0	0	3
5.	17154E76E	Composite Materials and Mechanics	3	0	0	3
6.	17154E76F	Human Rights	3	0	0	3
7.	17154E76G	Disaster Management	3	0	0	3

ELECTIVE – IV (VIII SEMESTER)

SI. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	17154E82A	Production Planning and Control	3	0	0	3
2.	17154E82B	Entrepreneurship Development	3	0	0	3
3.	17154E82C	Computer Integrated Manufacturing Systems	3	0	0	3
4.	17154E82D	Vibration and Noise Control	3	0	0	3
5.	17154E82E	Micro Electro Mechanical Systems	3	0	0	3
6.	17154E82F	Professional Ethics in Engineering	3	0	0	3
7.	17154E82G	Production operation And Management	3	0	0	3

FREE ELECTIVE – I

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1.	CSE	17150FE54A	Data Base management systems	3	0	0	3
2.		17150FE54B	Cloud computing	3	0	0	3
3.	ECE	17152FE54A	Basics Of Bio Medical Instrumentation	3	0	0	3
4.		17152FE54B	Sensors And Transducers	3	0	0	3
5.	EEE	17153FE54A	Industrial Nano Technology	3	0	0	3
6.		17153FE54B	Energy Conservation and Management	3	0	0	3
7.	MECH	17154FE54A	Renewable energy sources	3	0	0	3
8.		17154FE54B	Automotive Systems	3	0	0	3
9.		17154FE54C	MEMS	3	0	0	3
10.	CIVIL	17155FE54A	Air Pollution And Control Engineering	3	0	0	3
11.		17155FE54B	Geographic Information Systems	3	0	0	3

FREE ELECTIVE – II

Sl. No	DEPT	COURSE CODE	COURSE TITLE	L	T	P	C
1	CSE	17150FE74A	Introduction to C programming	3	0	0	3
2.		17150FE74B	Data structures and algorithms	3	0	0	3
3.	ECE	17152FE74A	Robotics	3	0	0	3
4.		17152FE74B	Electronic devices	3	0	0	3
5.	EEE	17153FE74A	Basic circuit theory	3	0	0	3
6.		17153FE74B	Introduction to renewable energy systems	3	0	0	3
7.	MECH	17154FE74A	Industrial safety	3	0	0	3
8.		17154FE74B	Testing of materials	3	0	0	3
9.	CIVIL	17155FE74A	Green building design	3	0	0	3
10.		17155FE74B	Waste water treatment	3	0	0	3

CGPA CREDITS

Semester	Core	Elective	Free Elective	Practical	Seminar	Comps	Project	Research	TOTAL
I	24	-	-	04	-	-	-	-	28
II	24	-	-	04	-	-	-	-	28
III	18	-	-	07	-	-	-	-	25
IV	19	-	-	05	-	-	-	01	25
V	13	03	**	06	-	-	-	03	25
VI	16	03	-	05	-	-	-	2	26
VII	09	09	**	04	1	02	-	04	29
VIII	03	03	-	-	-	-	10	-	16
TOTAL									202

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	**202**
NON-CGPA CREDITS	**05**
TOTAL	**207**

	L	T	P	C
17147S11 COMMUNICATIVE ENGLISH	**5**	**1**	**0**	**4**

OBJECTIVES:

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

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

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

UNIT II GENERAL READING AND FREE WRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- Writing – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –Listening- telephonic conversations. Speaking – sharing information of a personal kind—greeting – taking leave- Language development – prepositions, conjunctions Vocabulary development- guessing meanings of words in context.

UNIT III GRAMMAR AND LANGUAGE DEVELOPMENT 12

Reading- short texts and longer passages (close reading) Writing- understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences Listening – listening to longer texts and filling up the table- product description- narratives from different sources. Speaking- asking about routine actions and expressing opinions. Language development- degrees of comparison- pronouns- direct vs indirect questions- Vocabulary development – single word substitutes- adverbs.

UNIT IV READING AND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines Writing- letter writing, informal or personal letters-e-mails-conventions of personal email- Listening- listening to dialogues or conversations and completing exercises based on them. Speaking- speaking about oneself- speaking about one's friend- Language development- Tenses- simple present-simple past- present continuous and past continuous- Vocabulary development- synonyms-antonyms- phrasal verbs

UNIT V EXTENDED WRITING 12

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

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

17148S12 ENGINEERING MATHEMATICS – I L T P C

5 1 0 4

OBJECTIVES :

The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of 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
17149S13	**ENGINEERING PHYSICS**	**5**	**1**	**0**	**4**

OBJECTIVES:

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

UNIT I PROPERTIES OF MATTER 9

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

UNIT II WAVES AND FIBER OPTICS 9

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

UNIT III THERMAL PHYSICS 9

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

UNIT IV QUANTUM PHYSICS 9

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

UNIT V CRYSTAL PHYSICS 9

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

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course,

- the students will gain knowledge on the basics of properties of matter and its applications,
- the students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- the students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- the students will get knowledge on advanced physics concepts of quantum theory and its

applications in tunneling microscopes, and

- the students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:

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

REFERENCES:

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

17149S14	**ENGINEERING CHEMISTRY**	**L T P C**
		5 1 0 4

OBJECTIVES:

- To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
- To develop an understanding of the basic concepts of phase rule and its applications to single and two component systems and appreciate the purpose and significance of alloys.

- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.

Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

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

UNIT IV FUELS AND COMBUSTION 9

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

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

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

17154S15	**ENGINEERING GRAPHICS**	**L T P C**
		5 1 0 4

OBJECTIVES:

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

CONCEPTS AND CONVENTIONS (Not for Examination) 1

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+12

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

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

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

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

UNIT III PROJECTION OF SOLIDS 5+12

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

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

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 6+12

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

TOTAL: 90 PERIODS

OUTCOMES:

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

- familiarize with the fundamentals and standards of Engineering graphics
- perform freehand sketching of basic geometrical constructions and multiple views of objects.
- project orthographic projections of lines and plane surfaces.
- draw projections and solids and development of surfaces.
- visualize and to project isometric and perspective sections of simple solids.

TEXT BOOK:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited, 2008.

REFERENCES:

1. 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

17150S16	**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.

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.

17150L17	**PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY**	**L T P C** **0 0 3 2**

OBJECTIVES:

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

- Read and write data from/to files in Python.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. 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

17150L18 PHYSICS AND CHEMISTRY LABORATORY
(Common to all branches of B.E. / B.Tech Programme

L	T	P	C
0	0	3	2

OBJECTIVES:

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

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

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.

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)

171VEA19 VALUE EDUCATION	L	T	P	C
	0	**0**	**0**	**1**

UNIT – I
Concept of Human Values, Value Education Towards Personal Development
Aim of education and value education; Evolution of value oriented education; Concept of Human values; types of values; Components of value education.
Personal Development :
Self analysis and introspection; sensitization towards gender equality, physically challenged, intellectually challenged. Respect to - age, experience, maturity, family members, neighbours, co-workers.
Character Formation Towards Positive Personality:
Truthfulness, Constructivity, Sacrifice, Sincerity, Self Control, Altruism, Tolerance, Scientific Vision.

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

Constitutional or national values - Democracy, socialism, secularism, equality, justice, liberty, freedom and fraternity. Social Values - Pity and probity, self control, universal brotherhood. Professional Values - Knowledge thirst, sincerity in profession, regularity, punctuality and faith. Religious Values - Tolerance, wisdom, character. Aesthetic values - Love and appreciation of literature and fine arts and respect for the same. National Integration and international understanding.

UNIT – III Impact of Global Development on Ethics and Values
Conflict of cross-cultural influences, mass media, cross-border education, materialistic values, professional challenges and compromise.
Modern Challenges of Adolescent Emotions and behavior; Sex and spirituality: Comparision and competition; positive and negative thoughts.
Adolescent Emotions, arrogance, anger, sexual instability, selfishness, defiance.

UNIT - IV Theraupatic Measures

Control of the mind through
a. Simplified physical exercise
b. Meditation – Objectives, types, effect on body, mind and soul
c. Yoga – Objectives, Types, Asanas
d. Activities:
 (i) Moralisation of Desires
 (ii) Neutralisation of Anger
 (iii)Eradication of Worries
 (iv) Benefits of Blessings

UNIT; V Human Rights

1. Concept of Human Rights – Indian and International Perspectives
 a. Evolution of Human Rights
 b. Definitions under Indian and International documents

2. Broad classification of Human Rights and Relevant Constitutional Provisions.

a. Right to Life, Liberty and Dignity
b. Right to Equality
c. Right against Exploitation
d. Cultural and Educational Rights
e. Economic Rights
f. Political Rights
g. Social Rights

3. Human Rights of Women and Children
   a. Social Practice and Constitutional Safeguards
      (i) Female Foeticide and Infanticide
      (ii) Physical assault and harassment
      (iii) Domestic violence
      (iv) Conditions of Working Women

4. Institutions for Implementation
   a. Human Rights Commission
   b. Judiciary

5. Violations and Redressel
   a. Violation by State
   b. Violation by Individuals
   c. Nuclear Weapons and terrorism
   d. Safeguards.

17147S21 **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

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

17148S22A 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 – Mapping by various standard functions -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.

17149S23C	**MATERIALS SCIENCE** (Common to courses offered in Faculty of Mechanical Engineering Except B.E. Materials Science and Engineering)	**L**	**T**	**P**	**C**
		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-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.

17149S24A ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
5 1 0 4

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the interrelationship between living organism and environment.
- To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To study the dynamic processes and understand the features of the earth‟s interior and surface.
- To study the integrated themes and biodiversity, natural resources, pollution control and waste management.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

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

UNIT II ENVIRONMENTAL POLLUTION 8

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

UNIT III NATURAL RESOURCES 10

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

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

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:

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

REFERENCES :

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

17153S25D BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION L T P C ENGINEERING 5 1 0 4

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

17154S26D **ENGINEERING MECHANICS** **L T P C**

5 1 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.

17154L27 **ENGINEERING PRACTICES LABORATORY** **L T P C**
0 0 3 2

OBJECTIVES:

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

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

Buildings:

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

Plumbing Works:

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

Carpentry using Power Tools only:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
Wood work, joints by sawing, planing and cutting.

II MECHANICAL ENGINEERING PRACTICE

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.

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

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	

17153L28D **BASIC ELECTRICAL, ELECTRONICS AND INSTRUMENTATION ENGINEERING LABORATORY** **L T P C** **0 0 3 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)	-

171ICA29 FUNDAMENTALS OF INDIAN CONSTITUTION AND ECONOMY L P T C
1 0 0 1

UNIT-I: THE MAKING OF INDIAN CONSTITUTION

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

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

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

UNIT-III: DIRECTIVE PRINCIPLES OF STATE POLICY

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

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

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

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

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

REFERENCES:

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

17148S31C 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.

17154C32 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.

17154C33 **FLUID MECHANICS AND MACHINERY** **L T P C**
4 0 0 4

OBJECTIVES

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

UNIT I FLUID PROPERTIES AND FLOW CHARACTERISTICS 12

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

UNIT II FLOW THROUGH CIRCULAR CONDUITS 12

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

UNIT III DIMENSIONAL ANALYSIS 12

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

UNIT IV PUMPS 12

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

UNIT V TURBINES 12

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

TOTAL: 60 PERIODS

OUTCOMES:

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

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

TEXT BOOK:

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

REFERENCES:

1. Graebel. W.P, "Engineering Fluid Mechanics", Taylor & Francis, Indian Reprint, 2011
2. Kumar K. L., "Engineering Fluid Mechanics", Eurasia Publishing House(p) Ltd., New Delhi 2016
3. Robert W.Fox, Alan T. McDonald, Philip J.Pritchard, “Fluid Mechanics and Machinery”, 2011.
4. Streeter, V. L. and Wylie E. B., "Fluid Mechanics", McGraw Hill Publishing Co. 2010

17154C34 **PRODUCTION TECHNOLOGY – I** **L T P C**
3 0 0 3

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 9

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 9

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 9

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 9

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 9

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: 45 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.

17154C35 **ELECTRICAL DRIVES AND CONTROLS** **L T P C 3 0 0 3**

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 8

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

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 8

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. DRIVES10

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. DRIVES10

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

TOTAL: 45 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.

17154L36 **PRODUCTION TECHNOLOGY LABORATORY – I** **L T P C**
0 0 3 2

OBJECTIVE:

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

LIST OF EXPERIMENTS

Machining and Machining time estimations for:

1. Taper Turning
2. External Thread cutting
3. Internal Thread Cutting
4. Eccentric Turning
5. Knurling
6. Square Head Shaping
7. Hexagonal Head Shaping

8. Fabrication of simple structural shapes using Gas Metal Arc Welding
9. Joining of plates and pipes using Gas Metal Arc Welding/ Arc Welding /Submerged arc welding
10. Preparation of green sand moulds
11 Manufacturing of simple sheet metal components using shearing and bending operations.
12. Manufacturing of sheet metal components using metal spinning on a lathe

TOTAL: 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.

17154L37 COMPUTER AIDED MACHINE DRAWING L T P C
0 0 3 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 12

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

UNIT II INTRODUCTION TO 2D DRAFTING 16

- 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 32

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

17154L38 **ELECTRICAL ENGINEERING LABORATORY** **L T P C**
0 0 3 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

OUTCOME:

- Ability to perform speed characteristic of different electrical machine

TOTAL: 60 PERIODS

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

17154L39	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.

17148C41D **STATISTICS AND NUMERICAL METHODS** **L T P C**
4 0 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 12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT II DESIGN OF EXPERIMENTS 12

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 12

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method - Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigen values of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 12

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 : 60 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 ", 10th 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, 8th Edition, 2015.

REFERENCES :

1. Burden, R.L and Faires, J.D, "Numerical Analysis”, 9th Edition, Cengage Learning, 2016.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 8th 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", 8th Edition, Pearson Education, Asia, 2007.

17154C42 **THEORY OF MACHINES-I**

L	T	P	C
3	0	0	3

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

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

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

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

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

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 PERIODS

OUTCOMES:

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

CO1 Discuss the basics of mechanism
CO2 Calculate velocity and acceleration in simple mechanisms
CO3 Develop CAM profiles

CO4 Solve problems on gears and gear trains
CO5 Examine friction in machine elements

TEXT BOOKS:

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

REFERENCES:

1. Allen S. Hall Jr., “Kinematics and Linkage Design”, Prentice Hall, 1961
2. Cleghorn. W. L, “Mechanisms of Machines”, Oxford University Press, 2014
3. Ghosh. A and Mallick, A.K., “Theory of Mechanisms and Machines", 3^{rd} 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.

17154C43 **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.

17154C44	**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 Al_2O_3, SiC, Si_3N_4, 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.

17154C45 **STRENGTH OF MATERIALS FOR MECHANICAL ENGINEERS**

L	T	P	C
3	0	0	3

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

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

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

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

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

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 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.

17154C46 **THERMAL ENGINEERING - I**

L	T	P	C
3	0	0	3

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

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

UNIT II RECIPROCATING AIR COMPRESSOR 9

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

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

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

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

TOTAL:45 PERIODS

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

17154L47 PRODUCTION TECHNOLOGY LABORATORY – II

L	T	P	C
0	0	3	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: 60

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

17154L48	STRENGTH OF MATERIALS AND FLUID MECHANICS AND MACHINERY LABORATORY	L	T	P	C
		0	0	3	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 **30**

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 **30**

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: 60 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

17154L 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

17154C51 **THERMAL ENGINEERING – II**

L	T	P	C
3	0	0	3

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 Edition, Tata Mc Graw Hill Publications, 2010.

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.
5. Sydney Reiter "Industrial and Commercial Heat Recovery Systems" Van Nostrand Reinhols, 1985.

17154C52	DESIGN OF MACHINE ELEMENTS	L	T	P	C
		3	0	0	3

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

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

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

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

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

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

TOTAL: 45 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

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

REFERENCES:

1. Alfred Hall, Halowenko, A and Laughlin, H., "Machine Design", Tata McGraw-Hill BookCo.(Schaum's Outline), 2010
2. Ansel Ugural, "Mechanical Design – An Integral Approach", 1st Edition, Tata McGraw-Hill Book Co, 2003.
3. P.C. Gope, "Machine Design – Fundamental and Application", PHI learning private ltd, New Delhi, 2012.
4. R.B. Patel, "Design of Machine Elements", MacMillan Publishers India P Ltd., Tech-Max Educational resources, 2011.
5. Robert C. Juvinall and Kurt M. Marshek, "Fundamentals of Machine Design", 4th Edition, Wiley, 2005

17154C53 **METROLOGY AND MEASUREMENTS**

L	T	P	C
3	0	0	3

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 9

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 9

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 9

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 9

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 9

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 : 45 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.

17154C54 **THEORY OF MACHINES-II**

L	T	P	C
4	0	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 **12**

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 **12**

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 **12**

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 **12**

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 **12**

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 : 60 PERIODS

OUTCOMES:

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

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

TEXT BOOKS:

1. F. B. Sayyad, "Dynamics of Machinery", McMillan Publishers India Ltd., Tech-Max Educational resources, 2011.
2. Rattan, S.S, "Theory of Machines", 4^{th} 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.

17154L56 **THEORY OF MACHINES LABORATORY**

L	T	P	C
0	0	3	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.

17154L57 **THERMAL ENGINEERING LABORATORY**

L	T	P	C
0	0	3	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: 60 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.

17154L58	METROLOGY AND MEASUREMENTS LABORATORY	L	T	P	C
		0	0	3	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: 60 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

17154CRM **Research Methodology**

L	T	P	C
0	0	2	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.

17154C61 DESIGN OF TRANSMISSION SYSTEMS

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

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

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

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

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

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

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 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.

17154C62 **COMPUTER AIDED DESIGN AND MANUFACTURING** **L T P C**
3 0 0 3

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

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

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

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

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

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 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.

17154C63	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

17154C64 **FINITE ELEMENT ANALYSIS**

L	T	P	C
3	0	0	3

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**

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**

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**

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**

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**

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 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.

17154C65 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.

17154L67 **CAD / CAM LABORATORY**

L	T	P	C
0	0	3	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 **30 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. **30 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.

OUTCOMES

TOTAL: 60 PERIODS

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

17154L68 **DESIGN AND FABRICATION PROJECT**

L	T	P	C
0	0	3	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 : 60 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.

17154L69 **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.

17154C71	POWER PLANT ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVE:

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

UNIT I COAL BASED THERMAL POWER PLANTS 9

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

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS 9

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

UNIT III NUCLEAR POWER PLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working of Nuclear Reactors : Boili*ng 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 9

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

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS 9

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

TOTAL : 45 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.

17154C72 PROCESS PLANNING AND COST ESTIMATION

L	T	P	C
3	0	0	3

OBJECTIVE:

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

UNIT I INTRODUCTION TO PROCESS PLANNING 9

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

UNIT II PROCESS PLANNING ACTIVITIES 9

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

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

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

UNIT V MACHINING TIME CALCULATION 9

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 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.

17154C73 **MECHATRONICS**

L	T	P	C
3	0	0	3

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 9

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

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

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

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

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 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.

17154L77 **SIMULATION AND ANALYSIS LABORATORY** **L T P C**

0 0 3 2

OBJECTIVES:

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

LIST OF EXPERIMENTS A. SIMULATION

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

B. ANALYSIS

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

TOTAL: 60 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

17154L78 **MECHATRONICS LABORATORY**

L	T	P	C
0	0	3	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: 60 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.

17154L79 **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

17154C81	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

17154PW83	PROJECT WORK	L	T	P	C
		0	0	20	10

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.

17154E66A **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.

17154E66B **WELDING TECHNOLOGY** **L T P C**
3 0 0 3

OBJECTIVE:

- To understand the basics of welding and to know about the various types of welding processes

UNIT I GAS AND ARC WELDING PROCESSES: 9

Fundamental principles – Air Acetylene welding, Oxyacetylene welding, Carbon arc welding, Shielded metal arc welding, Submerged arc welding, TIG & MIG welding, Plasma arc welding and Electroslag welding processes - advantages, limitations and applications.

UNIT II RESISTANCE WELDING PROCESSES: 9

Spot welding, Seam welding, Projection welding, Resistance Butt welding, Flash Butt welding, Percussion welding and High frequency resistance welding processes - advantages, limitations and applications.

UNIT III SOLID STATE WELDING PROCESSES: 9

Cold welding, Diffusion bonding, Explosive welding, Ultrasonic welding, Friction welding, Forge welding, Roll welding and Hot pressure welding processes - advantages, limitations and applications.

UNIT IV OTHER WELDING PROCESSES: 9

Thermit welding, Atomic hydrogen welding, Electron beam welding, Laser Beam welding, Friction stir welding, Under Water welding, Welding automation in aerospace, nuclear and surface transport vehicles.

UNIT VDESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS 9

Various weld joint designs – Welding defects – causes and remedies - Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

TOTAL : 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able

- Understand the construction and working principles of gas and arc welding process.
- Understand the construction and working principles of resistance welding process.
- Understand the construction and working principles of various solid state welding process.
- Understand the construction and working principles of various special welding processes.
- Understand the concepts on weld joint design, weldability and testing of weldments.

TEXT BOOKS

1. Little R.L., "Welding and welding Technology", Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.
2. Parmer R.S., "Welding Engineering and Technology", 1st Edition, Khanna Publishers, New Delhi, 2008.
3. Parmer R.S., "Welding Processes and Technology", Khanna Publishers, New Delhi, 1992.

REFERENCES

1. AWS- Welding Hand Book. 8th Edition. Vol- 2. "Welding Process"
2. Christopher Davis. "Laser Welding- Practical Guide". Jaico Publishing House.
3. Davis A.C., "The Science and Practice of Welding", Cambridge University Press, Cambridge, 1993

4. Nadkarni S.V. “Modern Arc Welding Technology”, Oxford IBH Publishers, 1st Edition, 2005.
5. Schwartz M.M. “Metals Joining Manual”. McGraw Hill Books, 1979.
6. Tylecote R.F. “The Solid Phase Welding of Metals”. Edward Arnold Publishers Ltd. London.

17154E66C 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.

17154E66D **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. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002.
2. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012

REFERENCES

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

17154E66E **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.

17154E74A	REFRIGERATION AND AIR CONDITIONING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the underlying principles of operations in different Refrigeration & Air conditioning systems and components.
- To provide knowledge on design aspects of Refrigeration & Air conditioning systems

UNIT I INTRODUCTION 9

Introduction to Refrigeration - Unit of Refrigeration and C.O.P.– Ideal cycles- Refrigerants Desirable properties – Classification - Nomenclature - ODP & GWP.

UNIT II VAPOUR COMPRESSION REFRIGERATION SYSTEM 9

Vapor compression cycle : p-h and T-s diagrams - deviations from theoretical cycle – subcooling and super heating- effects of condenser and evaporator pressure on COP- multipressure system - low temperature refrigeration - Cascade systems – problems. Equipments: Type of Compressors, Condensers, Expansion devices, Evaporators.

UNIT III OTHER REFRIGERATION SYSTEMS 9

Working principles of Vapour absorption systems and adsorption cooling systems – Steam jet refrigeration- Ejector refrigeration systems- Thermoelectric refrigeration- Air refrigeration - Magnetic
- Vortex and Pulse tube refrigeration systems.

UNIT IV PSYCHROMETRIC PROPERTIES AND PROCESSES 9

Properties of moist Air-Gibbs Dalton law, Specific humidity, Dew point temperature, Degree of saturation, Relative humidity, Enthalpy, Humid specific heat, Wet bulb temperature Thermodynamic wet bulb temperature, Psychrometric chart; Psychrometric of air-conditioning processes, mixing of air streams.

UNIT V AIR CONDITIONING SYSTEMS AND LOAD ESTIMATION 9

Air conditioning loads: Outside and inside design conditions; Heat transfer through structure, Solar radiation, Electrical appliances, Infiltration and ventilation, internal heat load; Apparatus selection; fresh air load, human comfort & IAQ principles, effective temperature & chart, calculation of summer & winter air conditioning load; Classifications, Layout of plants; Air distribution system; Filters; Air Conditioning Systems with Controls: Temperature, Pressure and Humidity sensors, Actuators & Safety controls.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Explain the basic concepts of Refrigeration
CO2 Explain the Vapor compression Refrigeration systems and to solve problems
CO3 Discuss the various types of Refrigeration systems
CO4 Calculate the Psychrometric properties and its use in psychrometric processes
CO5 Explain the concepts of Air conditioning and to solve problems

TEXT BOOK:

1. Arora, C.P., "Refrigeration and Air Conditioning", 3rd edition, McGraw Hill, New Delhi, 2010.

REFERENCES:

1. ASHRAE Hand book, Fundamentals, 2010
2. Jones W.P., "Air conditioning engineering", 5th edition, Elsevier Butterworth-Heinemann, 2007
3. Roy J. Dossat, "Principles of Refrigeration", 4th edition, Pearson Education Asia, 2009.
4. Stoecker, W.F. and Jones J. W., "Refrigeration and Air Conditioning", McGraw Hill, New Delhi, 1986.

17154E74B **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

17154E74C **QUALITY CONTROL AND RELIABILITY ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce the concept of SQC
- To understand process control and acceptance sampling procedure and their application.
- To learn the concept of reliability.

UNIT I INTRODUCTION AND PROCESS CONTROL FOR VARIABLES 9

Introduction, definition of quality, basic concept of quality, definition of SQC, benefits and limitation of SQC, Quality assurance, Quality control: Quality cost-Variation in process causes of variation – Theory of control chart- uses of control chart –X chart, R chart and chart - process capability – process capability studies and simple problems. Six sigma concepts

UNIT II PROCESS CONTROL FOR ATTRIBUTES 9

Control chart for attributes –control chart for non conformings– p chart and np chart – control chart for nonconformities– C and U charts, State of control and process out of control identification in charts, pattern study.

UNIT III ACCEPTANCE SAMPLING 9

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

UNIT IV LIFE TESTING – RELIABILITY 9

Life testing – Objective – failure data analysis, Mean failure rate, mean time to failure, mean time between failure, hazard rate – Weibull model, system reliability, series, parallel and mixed configuration – simple problems. Maintainability and availability – simple problems. Acceptance sampling based on reliability test – O.C Curves.

UNIT V QUALITY AND RELIABILITY 9

Reliability improvements – techniques- use of Pareto analysis – design for reliability – redundancy unit and standby redundancy – Optimization in reliability – Product design – Product analysis – Product development–Product life cycles.

Note: Use of approved statistical table permitted in the examination.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Summarize the concept of Quality and Process control for variables
CO2 Apply the process control for attributes
CO3 Explain the concept of sampling and to solve problems
CO4 Explain the concept of Life testing
CO5 Explain the concept Reliability and techniques involved

TEXT BOOKS:

1. Douglas.C. Montgomery, "Introduction to Statistical quality control", 7th edition, John Wiley 2012.
2. Srinath. L.S., "Reliability Engineering", Affiliated East west press, 2008.

REFERENCES:
1. Besterfield D.H., "Quality Control", Prentice Hall, 2013.
2. Connor, P.D.T.O., "Practical Reliability Engineering", John Wiley, 2012
3. Danny Samson, "Manufacturing & Operations Strategy", Prentice Hall, 1991
4. Grant, Eugene .L "Statistical Quality Control", McGraw-Hill, 2017
5. Gupta. R.C, "Statistical Quality control", Khanna Publishers, 2001.

17154E74D	UNCONVENTIONAL 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.

17154E74E **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.

17154E74F **ADDITIVE MANUFACTURING** **L T P C**
3 0 0 3

OBJECTIVES:

- To know the principle, methods, possibilities and limitations as well as environmental effects of Additive Manufacturing technologies.
- To be familiar with the characteristics of the different materials those are used in Additive Manufacturing technologies.

UNIT I INTRODUCTION 9

Overview – Need - Development of Additive Manufacturing Technology -Principle – AM Process Chain- Classification –Rapid Prototyping- Rapid Tooling – Rapid Manufacturing – Applications-Benefits –Case studies.

UNIT II DESIGN FOR ADDITIVE MANUFACTURING 9

Design tools: Data processing - CAD model preparation – Part orientation and support structure generation – Model slicing –Tool path generation- Design for Additive Manufacturing: Concepts and objectives- AM unique capabilities – DFAM for part quality improvement- Customised design and fabrication for medical applications.

UNIT III PHOTOPOLYMERIZATION AND POWDER BED FUSION PROCESSES 9

Photo polymerization: SLA-Photo curable materials – Process - Advantages and Applications. Powder Bed Fusion: SLS-Process description – powder fusion mechanism – Process Parameters – Typical Materials and Application. Electron Beam Melting.

UNIT IV EXTRUSION BASED AND SHEET LAMINATION PROCESSES 9

Extrusion Based System: FDM-Introduction – Basic Principle – Materials – Applications and Limitations – Bioextrusion. Sheet Lamination Process:LOM- Gluing or Adhesive bonding – Thermal bonding.

UNIT V PRINTING PROCESSES AND BEAM DEPOSITION PROCESSES 9

Droplet formation technologies – Continuous mode – Drop on Demand mode – Three Dimensional Printing – Advantages – Bioplotter - Beam Deposition Process:LENS- Process description – Material delivery – Process parameters – Materials – Benefits – Applications.

TOTAL: 45 PERIODS

OUTCOME:

- On completion of this course, students will learn about a working principle and construction of Additive Manufacturing technologies, their potential to support design and manufacturing, modern development in additive manufacturing process and case studies relevant to mass customized manufacturing.

TEXT BOOKS:

1 Chua C.K., Leong K.F., and Lim C.S., **"**Rapid prototyping: Principles and applications**"**, Third edition, World Scientific Publishers, 2010.
2 Ian Gibson, David W.Rosen, Brent Stucker **"**Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing**"** Springer , 2010.

REFERENCES:

1 Andreas Gebhardt **"**Understanding Additive Manufacturing: Rapid Prototyping, Rapid Manufacturing**"** Hanser Gardner Publication 2011.
2 Kamrani A.K. and Nasr E.A., **"**Rapid Prototyping: Theory and practice**"**, Springer, 2006.
3 Liou L.W. and Liou F.W., **"**Rapid Prototyping and Engineering applications :A tool box for prototype development**"**, CRC Press, 2007.
4 Tom Page **"**Design for Additive Manufacturing**"** LAP Lambert Academic Publishing, 2012.

17154E74G **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. ISO 9001-2015 standards

17154E76A **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.

17154E76B	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.

17154E76C **COMPUTATIONAL FLUID DYNAMICS**

L	T	P	C
3	0	0	3

OBJECTIVES:

- To introduce Governing Equations of viscous fluid flows
- To introduce numerical modeling and its role in the field of fluid flow and heat transfer
- To enable the students to understand the various discretization methods, solution procedures and turbulence modeling.
- To create confidence to solve complex problems in the field of fluid flow and heat transfer by using high speed computers.

UNIT I GOVERNING EQUATIONS AND BOUNDARY CONDITIONS 9

Basics of computational fluid dynamics – Governing equations of fluid dynamics – Continuity, Momentum and Energy equations – Chemical species transport – Physical boundary conditions – Time-averaged equations for Turbulent Flow – Turbulent–Kinetic Energy Equations – Mathematical behaviour of PDEs on CFD - Elliptic, Parabolic and Hyperbolic equations.

UNIT II FINITE DIFFERENCE AND FINITE VOLUME METHODS FOR DIFFUSION 9

Derivation of finite difference equations – Simple Methods – General Methods for first and second order accuracy – Finite volume formulation for steady state One, Two and Three - dimensional diffusion problems –Parabolic equations – Explicit and Implicit schemes – Example problems on elliptic and parabolic equations – Use of Finite Difference and Finite Volume methods.

UNIT III FINITE VOLUME METHOD FOR CONVECTION DIFFUSION 9

Steady one-dimensional convection and diffusion – Central, upwind differencing schemes properties of discretization schemes – Conservativeness, Boundedness, Transportiveness, Hybrid, Power-law, QUICK Schemes.

UNIT IV FLOW FIELD ANALYSIS 9

Finite volume methods -Representation of the pressure gradient term and continuity equation – Staggered grid – Momentum equations – Pressure and Velocity corrections – Pressure Correction equation, SIMPLE algorithm and its variants – PISO Algorithms.

UNIT V TURBULENCE MODELS AND MESH GENERATION 9

Turbulence models, mixing length model, Two equation (k-Є) models – High and low Reynolds number models – Structured Grid generation – Unstructured Grid generation – Mesh refinement – Adaptive mesh – Software tools.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Derive the governing equations and boundary conditions for Fluid dynamics
CO2 Analyze Finite difference and Finite volume methods for Diffusion
CO3 Analyze Finite volume method for Convective diffusion
CO4 Analyze Flow field problems
CO5 Explain and solve the Turbulence models and Mesh generation techniques

TEXT BOOKS:

1. Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw Hill Publishing Company Ltd., 2017.
2. Versteeg, H.K., and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The finite volume Method", Pearson Education Ltd.Second Edition, 2007.

REFERENCES:

1. Anil W. Date "Introduction to Computational Fluid Dynamics" Cambridge University Press, 2005.
2. Chung, T.J. "Computational Fluid Dynamics", Cambridge University, Press, 2002.
3. Ghoshdastidar P.S., "Heat Transfer", Oxford University Press, 2005
4. Muralidhar, K., and Sundararajan, T., "Computational Fluid Flow and Heat Transfer", Narosa Publishing House, New Delhi, 2014.
5. Patankar, S.V. "Numerical Heat Transfer and Fluid Flow", Hemisphere Publishing Corporation, 2004

17154E76D	NON DESTRUCTIVE TESTING AND EVALUATION	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To study and understand the various Non Destructive Evaluation and Testing methods, theory and their industrial applications.

UNIT I OVERVIEW OF NDT 9

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

UNIT II SURFACE NDE METHODS 9

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

UNIT III THERMOGRAPHY AND EDDY CURRENT TESTING (ET) 9

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

UNIT IV ULTRASONIC TESTING (UT) AND ACOUSTIC EMISSION (AE) 9

Ultrasonic Testing-Principle, Transducers, transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique – Principle, AE parameters, Applications

UNIT V RADIOGRAPHY (RT) 9

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

TOTAL : 45 PERIODS

OUTCOMES:

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

CO1 Explain the fundamental concepts of NDT
CO2 Discuss the different methods of NDE
CO3 Explain the concept of Thermography and Eddy current testing
CO4 Explain the concept of Ultrasonic Testing and Acoustic Emission
CO5 Explain the concept of Radiography

TEXT BOOKS:

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

REFERENCES:

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

17154E76E	COMPOSITE MATERIALS AND MECHANICS	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.

17154E76F **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. Chandra U., "Human Rights", Allahabad Law Agency, Allahabad, 2014.
2. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi.

17154E76G **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 Processess 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, Scenarious in the Indian context, Disaster damage assessment and management.

TEXT BOOKS:

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
2. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.
3. Singhal J.P. “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
4. Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. **ISBN-10:** 1259007367, **ISBN-13:** 978-1259007361]

REFERENCES

1. Govt. of India: Disaster Management Act , Government of India, New Delhi, 2005
2. Government of India, National Disaster Management Policy,2009.

17154E82A 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

ENTREPRENEURSHIP DEVELOPMENT

	L	T	P	C
17154E82B	**3**	**0**	**0**	**3**

OBJECTIVE:

- To develop and strengthen entrepreneurial quality and motivation in students and to impart basic entrepreneurial skills and understanding to run a business efficiently and effectively.

UNIT I ENTREPRENEURSHIP 9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT II MOTIVATION 9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9

Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures - Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL : 45 PERIODS

OUTCOME:

- Upon completion of the course, students will be able to gain knowledge and skills needed to run a business successfully.

TEXT BOOKS :

th

1. Donald F Kuratko, “Entrepreneurship – Theory, Process and Practice”, 9 Learning, 2014.Edition, Cengage
2. Khanka. S.S., “Entrepreneurial Development” S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.

REFERENCES :

1. EDII “Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development”, Institute of India, Ahmadabad, 1986.
2. Hisrich R D, Peters M P, “Entrepreneurship” 8th Edition, Tata McGraw-Hill, 2013.
3. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis” 2 nd

Edition Dream tech, 2005.
4. Rajeev Roy, "Entrepreneurship" 2nd Edition, Oxford University Press, 2011.

17154E82C 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

EXT 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.

17154E82D **VIBRATION AND NOISE CONTROL**

L	T	P	C
3	0	0	3

OBJECTIVE:

- The student will be able to understand the sources of vibration and noise in automobiles and make design modifications to reduce the vibration and noise and improve the life of the components

UNIT I BASICS OF VIBRATION **9**

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

UNIT II BASICS OF NOISE **9**

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

UNIT III AUTOMOTIVE NOISE SOURCES **9**

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

UNIT IV CONTROL TECHNIQUES **9**

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

UNIT V SOURCE OF NOISE AND CONTROL **9**

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

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1 Summarize the Basics of Vibration
CO2 Summarize the Basics of Noise
CO3 Explain the Sources of Automotive Noise
CO4 Discuss the Control techniques for vibration
CO5 Describe the sources and control of Noise

TEXT BOOK:

1. Singiresu S.Rao, "Mechanical Vibrations", 6th Edition, Pearson Education, 2016.

REFERENCES:

1. Balakumar Balachandran and Edward B. Magrab, "Fundamentals of Vibrations", 1st Editon,

Cengage Learning, 2009
2. Benson H. Tongue, “Principles of Vibrations”, 2nd Edition, Oxford University, 2007
3. Bernard Challen and Rodica Baranescu - “Diesel Engine Reference Book”, Second Edition, SAE International, 1999.
4. David Bies and Colin Hansen, “Engineering Noise Control – Theory and Practice”,4th Edition, E and FN Spon, Taylore & Francise e-Library, 2009
5. Grover. G.T., “Mechanical Vibrations”, Nem Chand and Bros., 2009

17154E82E	MICRO ELECTRO MECHANICAL SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
- To educate on the rudiments of Micro fabrication techniques.
- To introduce various sensors and actuators
- To introduce different materials used for MEMS
- To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

UNIT I INTRODUCTION 9

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys

UNIT III SENSORS AND ACTUATORS-II 9

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING 9

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process.

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 PERIODS

OUTCOMES

- Ability to understand and apply basic science, circuit theory, Electro-magnetic field theory control theory and apply them to electrical engineering problems.
- Ability to understand and analyse, linear and digital electronic circuits.

TEXT BOOKS:

1. Chang Liu, "Foundations of MEMS", Pearson Education Inc., 2006.
2. Stephen D Senturia, "Microsystem Design", Springer Publication, 2000.
3. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.

REFERENCES:

1. James J.Allen, "Micro Electro Mechanical System Design", CRC Press Publisher, 2010
2. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, "Micro Sensors MEMS and Smart Devices", John Wiley & Son LTD,2002
3. Mohamed Gad-el-Hak, editor, “ The MEMS Handbook”, CRC press Baco Raton, 2000
4. Nadim Maluf,“ An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.
5. Thomas M.Adams and Richard A.Layton, “Introduction MEMS, Fabrication and Application,” Springer 2012.

17154E82F **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.
6. World Community Service Centre, ' Value Education', Vethathiri publications, Erode, 2011.

Web sources:

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

FREE ELECTIVE –I

17150FE54A	**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.

17150FE54B **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.

17152FE54A **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.

17152FE54B **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.

17153FE54A **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)

17153FE54B **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.

17154FE54A **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

17154FE54B

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.

17155FE54A **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.

17155FE54B **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

FREE ELECTIVE II

17150FE74A **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

17150FE74B 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

17152FE74A **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.

17152FE74B 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", 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.

17153FE74A 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.

17153FE74B 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.

17154FE74A **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.

17154FE74B **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”, 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.

17155FE74A **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

17155FE74B **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.

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Vallam, Thanjavur.

DEPARTMENT OF
MECHANICAL ENGINEERING

PROGRAM HANDBOOK

B.TECH
MECHANICAL ENGINEERING
PART TIME
[REGULATION 2017]

SEMESTER – I

Sl. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17148H11P	Transforms & Partial Differential Equations	3	1	0	4
2	17153H12P	Electrical drives and controls	3	0	0	3
3	17154H13P	Engineering Thermodynamics	3	1	0	4
4	17154H14P	Fluid Mechanics and Machinery	3	1	0	4
5	17154H15P	Foundry And Welding Technology	4	0	0	4
					Total No of Credits	19

SEMESTER – II

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17148H21P	Numerical Methods	3	1	0	4
2	17153H22P	Electronics and Microprocessors	3	0	0	3
3	17154H23P	Thermal Engineering	3	1	0	4
4	17154H24P	Strength of Materials	3	1	0	4
5	17154H25P	Engineering Materials and Metallurgy	4	0	0	4
					Total No of Credits	19

SEMESTER – III

S. No	Subject Code	Subject Name	Periods Per Week L	T	P	C
1	17148H31CP	Probability and Statistics	3	1	0	4
2	17154H32P	Kinematics of Machinery	3	1	0	4
3	17154H33P	Machine Tool Technology	4	0	0	4
4	17154H34P	Engineering Metrology and Measurements	4	0	0	4
5	17154L35P	Computer Aided Simulation and Analysis Laboratory	0	0	3	2
					Total No of Credits	18

SEMESTER –IV

S. No	Subject Code	Subject Name	Periods Per Week L	T	P	C
1	17154H41P	Power Plant Engineering	4	0	0	4
2	17154H42P	Dynamics of Machinery	3	1	0	4
3	17154H43P	Design of Machine Elements	3	1	0	4
4	171--E44-P	Elective -I	4	0	0	4
5	17154L45P	Dynamics Laboratory	0	0	3	2
					Total No of Credits	18

SEMESTER – V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17154H51P	Heat and Mass Transfer	3	1	0	4
2	17154H52P	Design of Transmission Systems	3	1	0	4
3	17154H53P	Automobile Engineering	4	0	0	4
4	171--E54-P	Elective-II	4	0	0	4
5	17154L55P	Heat Transfer Laboratory	0	0	3	2
Total No of Credits						18

SEMESTER –VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17154H61P	Finite Elements Analysis	3	1	0	4
2	17154H62P	Mechatronics	4	0	0	4
3	17154H63P	Computer Integrated Manufacturing	4	0	0	4
4	171--E64-P	Elective-III	4	0	0	4
5	17154L65P	Mechatronics Laboratory	0	0	3	2
Total No of Credits						18

SEMESTER –VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160H71P	Total Quality Management	3	0	0	3
2	17154H72P	Process Planning and Cost Estimation	3	1	0	4
3	17154H73P	Applied Hydraulics and Pneumatics	4	0	0	4
4	171--E74-P	Elective-IV	3	0	0	3
5	17154P75P	Project Work	0	0	12	6
Total No of Credits						20

TOTAL NO OF CREDITS FROM SEMESTER I TO VII – 130

LIST OF ELECTIVES

ELECTIVE I

SEMESTER – IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17154E44AP	Gas Dynamics and Jet Propulsion	3	1	0	4
2	17154E44BP	Refrigeration and Air Conditioning	3	1	0	4
3	17160E44CP	Marketing Management	4	0	0	4
4	17154E44DP	Renewable Sources of Energy	4	0	0	4

ELECTIVE II

SEMESTER – V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17158E54AP	Environmental Science and Engineering	4	0	0	4
2	17154E54BP	Composite Materials	4	0	0	4
3	17154E54CP	Robotics	4	0	0	4
4	17154E54DP	Design of Jigs, Fixtures and Press Tools	3	1	0	4

ELECTIVE III

SEMESTER – VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160E64AP	Principles of Management	4	0	0	4
2	17154E64BP	Nuclear Engineering	4	0	0	4
3	17154E64CP	Thermal Turbo Machines	3	1	0	4
4	17148E64DP	Mathematics for Industrial Operations	3	1	0	4

ELECTIVE IV

SEMESTER – VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160E74AP	Quality Control and Reliability Engineering	3	0	0	3
2	17154E74BP	Vibration and Noise Control	3	0	0	3
3	17154E74CP	Unconventional Machining Process	3	0	0	3
4	17154E74DP	Industrial Engineering	3	0	0	3

17148H11P TRANSFORMS & PARTIAL DIFFERENTIAL EQUATIONS

UNIT I PARTIAL DIFFERENTIAL EQUATIONS 9 + 3

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

UNIT II FOURIER SERIES 9 + 3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identify – Harmonic Analysis.

UNIT III BOUNDARY VALUE PROBLEMS 9 + 3

Classification of second order quasi linear partial differential equations – Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates.

UNIT IV FOURIER TRANSFORM 9 + 3

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

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3

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

TUTORIAL 15
TOTAL : 60

TEXT BOOKS

1. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers, Delhi, 2001.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCES

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.

17154H13P ENGINEERING THERMODYNAMICS

UNIT- I: BASIC CONCEPTS 9

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

UNIT – II: SECOND LAW, ENTROPY AND AVAILABILITY 9

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

UNIT – III: STEAM POWER CYCLE 9

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

UNIT – IV : THERMODYNAMIC RELATIONS 9

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

UNIT – V: PSYCHROMETRY 9

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

TUTORIALS 15 TOTAL HOURS: 60

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

TEXT BOOKS

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

REFERENCES

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

17154H14P FLUID MECHANICS AND MACHINERY

1. BASIC CONCEPTS AND PROPERTIES 6

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

2. KINEMATICS OF FLUID AND FLUID DYNAMICS 12

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

3. INCOMPRESSIBLE FLUID FLOW 12

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

4. HYDRAULIC TURBINES 8

Fluid machines: definition and classification - exchange of energy - Euler's equation for turbo machines - Construction of velocity vector diagrams - head and specific work - components of energy transfer - degree of reaction.

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

5. HYDRAULIC PUMPS 7

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

TUTORIALS 15 TOTAL : 60

TEXT BOOKS

Streeter, V.L., and Wylie, E.B., “Fluid Mechanics”, McGraw-Hill, 1983.
Kumar, K.L., “Engineering Fluid Mechanics”, Eurasia Publishing House (P) Ltd, New Delhi (7th edition), 1995.
Vasandani, V.P., “Hydraulic Machines - Theory and Design”, Khanna Publishers.1992

REFERENCES

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

7154H15P FOUNDRY & WELDING TECHNOLOGY

UNIT-I: INTRODUCTION 9

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

UNIT – II: MOULDING PROCESSES 9

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

UNIT – III: CASTING PROCESSES 9

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

UNIT – IV: SPECIAL WELDING PROCESSES 9

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

UNIT – V: MODERN WELDING PROCESSES 9

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

TUTORIALS: 15

TOTAL HOURS: 60

TEXT BOOK

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

REFERENCES

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

17154H23P THERMAL ENGINEERING

UNIT-I: GAS POWER CYCLES 9

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

UNIT – II: INTERNAL COMBUSTION ENGINES 9

Classification of IC engine, IC engine components and functions. Comparison of two stroke and four stroke engines. Fuel supply systems, Ignition Systems, Performance calculation. Comparison of petrol & diesel engine. Fuels, Knocking and Detonation. Lubrication system and cooling system. Exhaust gas analysis, pollution control nor

UNIT – III: STEAM NOZZLES AND TURBINES 9

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

UNIT – IV: AIR COMPRESSORS 9

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

UNIT – V: REFRIGERATION AND AIR-CONDITIONING 9

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

TUTORIALS : 15
TOTAL HOURS : 60

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

TEXT BOOKS

1. Rajput, "Thermal Engineering", S. Chand publishers, 2000.

REFERENCES

1. Kothandaraman.C.P., Domkundwar.S. and A.V.Domkundwar., "A course in Thermal Engineering", Dhanpat Rai & Sons, Fifth edition, 2002
2. Holman. J.P., "Thermodynamics", McGraw-Hill, 1985.

3. Rogers, Meyhew, “Engineering Thermodynamics”, ELBS, 1992.
4. Arora.C.P., “Refrigeration and Air conditioning”, TMH, 1994.
Sarkar B.K, “ Thermal Engineering”, Tata McGraw-Hill, 1998**.**

17154H24P STRENGTH OF MATERIALS

1. STRESS AND STRAIN 9

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

2. BEAMS - SFD & BMD 9

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

3. TORSION IN SHAFTS 9

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

4. DEFLECTION IN SPRINGS 9

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

5. ANALYSIS OF STRESSES IN TWO DIMENSIONS 9

Thin cylindrical and spherical shells – Deformation in thin cylindrical and spherical shells – Biaxial stresses at a point –Principal planes and stresses – Analytical Method- Graphical

Method: Mohr's circle – Only for two stresses applied mutually perpendicular to each other on a body– Maximum shear stress.

TUTORIALS 15
TOTAL: 60

TEXT BOOKS

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

REFERENCE BOOKS

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

17154H25P ENGINEERING MATERIALS AND METALLURGY

1. CONSTITUTION OF ALLOYS AND PHASE DIAGRAMS 10

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

2. HEAT TREATMENT 11

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

3. FERROUS AND NON FERROUS METALS 9

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

4. NON-METALLIC MATERIALS 9

Polymers – types of polymer– Properties and applications of PE, PP, PS, PVC, PMMA, PET, PC, PA, ABS, PI, PAI, PPO, PPS, PEEK, PTFE Polymers — Engineering Ceramics – Properties and applications of Al_2O_3, SiC, SiC, Si_3, N_4, PSZ and Sialon – Fibre and particulate reinforced composites.

5. MECHANICAL PROPERTIES AND TESTING 6

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

Total Hours : 45

TEXT BOOK:

1. Kenneth G.Budinski and Michael K.Budinski “Engineering Materials” Prentice-Hall of India Private Limited, 4th Indian Reprint 2002.

REFERENCES:

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

17154H33P MACHINE TOOL TECHNOLOGY

UNIT – I: METAL CUTTING THEORY 8

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

UNIT –II: CENTRE LATHE AND SPECIAL PURPOSE LATHES 10

Centre lathe, constructional features, cutting tools, various operations, taper turning methods, thread cutting methods, special attachments, machining time and power estimation.
Capstan and turret lathes – automatic lathes : semi automatic, automats – single spindle : cutting off, multi spindle; cutting off machines.

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

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

UNIT – IV: GRINDING, BROACHING AND GEAR CUTTING 10

Grinding: Introduction- Grinding wheel – specifications and selection, types of grinding process – cylindrical grinding, surface grinding, centreless grinding – honing, lapping, super finishing, polishing and buffing.
Broaching Machines: broach Specification – push, pull, surface and continuous broaching machines, Gear cutting: forming, generation, shaping, Hobbing.

UNIT – V: CNC MACHINES AND APT PROGRAMMING 7

Numerical Control (NC) machine tools – CNC – Introduction, Types, constructional details, special features, Advantages and applications.
Part programming fundamentals – manual programming – computer assisted part programming – APT language.

TOTAL : 45

TEXT BOOKS :

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

REFERENCES:

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

17154L35P COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY

LIST OF EXPERIMENTS

A. Simulation ***15***

1. Simulation of cam and follower mechanism using C / MAT Lab.

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

TOTAL : 45

17154H41P POWER PLANT ENGINEERING

UNIT – I: INTRODUCTION : 9

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

UNIT – II: STEAM POWER PLANT 9

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

UNIT – III: NUCLEAR AND HYDEL POWER PLANTS 9

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

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

UNIT – IV: DIESEL AND GAS TURBINE POWER PLANT 9

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

UNIT – V: POWER PLANTS ECONOMICS 9

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

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

Total Hours: 45

TEXT BOOKS:

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

REFERENCES:

1. K.K.Ramalingam, “Power Plant Engineering”, Scitech Publications, 2002.
2. Frank D.Graham “Power Plant Engineers Guide”, D.B. Taraporevala Sons & Co, New Delhi, 1993.
3. T.Morse Frederick, “Power Plant Engineering”, Prentice Hall of India, 1998

17154H42P DYNAMICS OF MACHINERY

UNIT – I: FORCE ANALYSIS IN MOVING PARTS 10

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

UNIT – II: BALANCING OF MOVING PARTS 9

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

UNIT – III: FREE VIBRATIONS 10

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

UNIT – IV: FORCED VIBRATIONS 6

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

UNIT – V: MECHANISMS FOR CONTROL 10

Governors - Types - Centrifugal governors - Gravity controlled and spring controlled centrifugal governors –Characteristics - Effect of friction - Controlling Force -
Gyroscopes - Gyroscopic forces and Torques - Gyroscopic stabilization - Gyroscopic effects in Automobiles, ships and airplanes

TUTORIAL 15 TOTAL HOURS : 60

TEXT BOOKS:

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

REFERENCES:

1 Ghosh A. and Mallick A.K., "Theory of Mechanisms and Machines", Affiliated East-West Press Pvt. Ltd., New Delhi, 1988.
2 Shigley J.E. and Uicker J.J., "Theory of Machines and Mechanisms", McGraw-Hill, Inc., 1995.
3. Rao J.S. and Dukkipati R.V., "Mechanism and Machine Theory ", Wiley-Eastern Limited, New Delhi, 1992.
4 John Hannah and Stephens R.C., "Mechanics of Machines", Viva low-Priced Student Edition, 1999.
5 Sadhu Singh "Theory of Machines" Pearson Education, 2002

17154H43P DESIGN OF MACHINE ELEMENTS

UNIT – I : STRESSES IN MACHINE MEMBERS 9

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

UNIT – II: DESIGN OF SHAFTS AND COUPLINGS 9

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

UNIT – III: DESIGN OF FASTNERS AND WELDED JOINTS 9

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

UNIT – IV: DESIGN OF SPRINGS AND LEVERS 9

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

UNIT – V: DESIGN OF BEARINGS AND FLYWHEELS 9

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

TUTORIAL 15
TOTAL HOURS : 60

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

TEXT BOOKS:

1. Juvinall R.C, and Marshek K.M, “Fundamentals of Machine Component Design”, John Wiley & Sons, Third Edition, 2002.

2. Bhandari V.B, “Design of Machine Elements”, Tata McGraw-Hill Book Co, 2003.

REFERENCES:

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

STANDARDS:

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

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

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

17154H51P HEAT AND MASS TRANSFER

UNIT – I: CONDUCTION **11**

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

UNIT – II: CONVECTION **10**

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

UNIT – III: HEAT EXCHANGERS **9**

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

UNIT – IV: RADIATION **8**

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

UNIT – V: MASS TRANSFER **7**

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

TUTORIAL:15 ***TOTAL HOURS 60***

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

TEXT BOOKS:

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

REFERENCES:

3. Ozisik M.N, “Heat Transfer”, McGraw-Hill Book Co., 1994.
4. Holman J.P “Heat and Mass Transfer” Tata McGraw-Hill, 2000.
5. Frank P. Incropera and David P. DeWitt, “Fundamentals of Heat and Mass Transfer”, John Wiley and Sons, 1998.

17154H52P DESIGN OF TRANSMISSION SYSTEMS

UNIT – I: DESIGN OF TRANSMISSION SYSTEMS 9

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

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

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

UNIT – III: BEVEL AND CROSS HELICAL GEARS 9

Straight bevel gear: Tooth terminology, tooth forces and stresses, equivalent number of teeth. Estimating the dimensions of pair of straight bevel gears.
Cross helical: Terminology-helix angles-Estimating the size of the pair of cross helical gears.

UNIT – IV: GEAR BOXES DESIGN 9

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

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

Cam Design: Types-pressure angle and under cutting base circle determination-forces and surface stresses.
Design of plate clutches –axial clutches-cone clutches-internal expanding rim clutches-

TUTORIALS 30

TOTAL HOURS: 75

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

TEXT BOOKS

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

REFERENCES

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

17154H53P AUTOMOBILE ENGINEERING

UNIT – I: STRUCTURE OF VEHICLESAND ENGINES 10

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

UNIT – II: ENGINE AUXILIARY SYSTEMS 10

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

UNIT – III: TRANSMISSION SYSTEMS 10

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

UNIT – IV: STEERING, BRAKES AND SUSPENSION 10

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

UNIT – V: ALTERNATIVE ENERGY SOURCES 5

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

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

Total Hours : 45

TEXT BOOKS:

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

REFERENCES:

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

17154H61P FINITE ELEMENT ANALYSIS

UNIT – I: INTRODUCTION TO FEA: 9

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

UNIT – II: ONE DIMENSIONAL PROBLEMS 9

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

UNIT – III: TWO DIMENSIONAL PROBLEMS 9

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

UNIT – IV: AXISYMMETRIC PROBLEMS 9

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

UNIT – V: ISOPARAMETRIC ELEMENTS 9

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

TUTORIAL 15
TOTAL HOURS :60

TEXT BOOKS*:*

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

REFERENCES:

1. Rao S.S., "The Finite Element Method in Engineering", Pergammon Press, 1989
2. Logan D.L., "A First course in the Finite Element Method", Third Edition, Thomson Learning, 2002.
3. Robert D.Cook., David.S, Malkucs Michael E Plesha, "Concepts and Applications of Finite Element Analysis" 4 Ed. Wiley, 2003.

17154H62P MECHATRONICS

UNIT – I: INTRODUCTION 9

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

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

UNIT – II: POWER DRIVE SYSTEM 9

Pneumatic and Hydraulic Systems – Directional Control Valves – Rotary Actuators.

Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl – Belt and Chain Drives – Bearings.

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

UNIT – III: SYSTEM MODELS AND CONTROLLERS 9

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

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

UNIT – IV: PROGRAMMING LOGIC CONTROLLERS(PLC) 9

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

UNIT – V: DESIGN OF MECHATRONICS SYSTEM 9

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

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

Total Hours : 45

TEXT BOOKS:

1. W. Bolton, "Mechatronics", Pearson Education, Second Edition, 1999.

REFERENCES

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

17154H63P COMPUTER INTEGRATED MANUFACTURING

UNIT – I: INTRODUCTION 8

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

UNIT – II: GROUP TECHNOLOGY AND CAPP 10

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

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

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

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

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

UNIT – IV: CIM IMPLEMENTATION AND LAN 10

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

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

UNIT – V: OPEN SYSTEM AND DATABASE FOR CIM 8

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

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

Total Hours : 45

TEXT BOOKS*:*

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

REFERENCES:

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

17160H71P TOTAL QUALITY MANAGEMENT

UNIT – I: BASICS OF TQM 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT – II: PRINCIPLES OF TQM 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT – III: QUALITY CONCEPTS 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Concept of six sigma,

UNIT – IV: TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages of FMEA.

UNIT – V: ISO STANDARDS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOKS:

1. Dale H. Besterfiled, et al., "Total Quality Management", Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker, " TOTAL QUALITY MANAGEMENT", Anuradha Agencies.

REFERENCES:

1. Feigenbaum.A.V. "Total Quality Management", McGraw Hill, 1991.
2. Oakland.J.S. "Total Quality Management", Butterworth – Hcinemann Ltd., Oxford. 1989.
3. Narayana V. and Sreenivasan, N.S. "Quality Management – Concepts and Tasks", New Age International 1996

17154H72P PROCESS PLANNING AND COST ESTIMATION

UNIT-I: WORK STUDY AND TIME STUDY 10

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

UNIT-II: PROCESS PLANNING 10

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

UNIT-III: INTRODUCTION TO COST ESTIMATION 7

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

UNIT-IV: COST ESTIMATION 8

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

UNIT-V: PRODUCTION COST ESTIMATION 10

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

TEXT BOOKS:

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

REFERENCES:

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

17154H73P APPLIED HYDRAULICS AND PNEUMATICS

UNIT – I: FUNDAMENTALS OF FLUID POWER SYSTEM 9

Fluid power, Advantages Application .Types of fluid power systems, Properties of hydraulic fluids – General types of fluids – Fluid power symbols.

Basics of Hydraulics- Pascals Law- Laminar and Turbulent flow – Reynold's number

UNIT – II: HYDRAULIC SYSTEM & COMPONENTS 9

Sources of Hydraulic Power: Pump classification – Gear pump, Vane Pump, piston pump, construction and working of pumps – pump characteristics – Variable displacement pumps.

Actuators: Linear hydraulic actuators – Types of hydraulic cylinders – Single acting, Double acting special cylinders like tanden, Rodless, Telescopic, Cushioning mechanism, Construction of double acting cylinder, Rotary actuators – Fluid motors, Gear, Vane and Piston motors.

UNIT – III: DESIGN OF HYDRAULIC CIRCUITS 9

Construction of Control Components : Director control valve – 3/2 way valve – 4/2 way valve – Shuttle valve – check valve – pressure control valve –Flow control valve – Fixed and adjustable, electrical control solenoid valves, Relays, ladder diagram.

Accumulators and Intensifiers : Types of accumulators – Accumulators circuits, sizing of accumulators, intensifier – Applications of Intensifier – Intensifier circuit.

UNIT – IV: PNEUMATIC SYSTEMS AND COMPONENTS 9

Pneumatic Components: Properties of air – Compressors – Filter, Regulator, Lubricator Unit – Air control valves, Quick exhaust valves, pneumatic actuators.

Fluid Power Circuit Design, Speed control circuits, synchronizing circuit, , Sequential circuit design for simple applications using cascade method.

UNIT – V: DESIGN OF PNEUMATIC CIRCUITS 9

Servo systems – Hydro Mechanical servo systems, Electro hydraulic servo systems and proportional valves.

Fluidics – Introduction to fluidic devices, simple circuits,. Fluid power circuits; failure and troubleshooting.

Total Hours : 45

TEXT BOOKS :

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

REFERENCES:

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

LIST OF ELECTIVES

17154E44AP GAS DYNAMICS AND JET PROPULSION

UNIT – I: FUNDAMENTALS OF COMPRESSIBLE FLOW 8

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

UNIT – II: FLOW THROUGH VARIABLE AREA DUCTS 9

Isentropic flow through variable area ducts, T-s and h-s diagrams for nozzle and diffuser flows, area ratio as a function of Mach number, mass flow rate through nozzles and diffusers, effect of friction in flow through nozzles.

UNIT – III : Flow through Constant Area Ducts 10

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

UNIT – IV: NORMAL SHOCK 8

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

UNIT – V: PROPULSION 10

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

TUTORIAL 15
TOTAL HOURS : 60

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

TEXT BOOKS

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

REFERENCES:

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

17160E44CP MARKETING MANAGEMENT

1. MARKETING PROCESS 9

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. selling versus marketing, industrial versus consumer marketing,

2.BUYING BEHAVIOUR AND MARKET SEGMENTATION 9

Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -Psycho graphic and geographic segmentation, process, patterns.

3.PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives, pricing, decisions and pricing methods, process of marketing research.

4.MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan-strategy formulations and the marketing process, implementations, portfolio analysis, BCG, GEC grids.

5.ADVERTISING, SALES PROMOTION AND DISTRIBUTION 9

Characteristics, impact, goals, types, and sales promotions- point of purchase- unique selling proposition. Characteristics, wholesaling, retailing, channel design, logistics, and modern trends in retailing.

TOTAL : 45

TEXT BOOKS

1. Ramasamy and Nama kumari, “Marketing Environment: Planning, implementation and control the Indian context”, 1990.
2. Govindarajan. M, “Industrial marketing management”, Vikas Publishing Pvt. Ltd, 2003.

REFERENCES

1. Philip Kolter, “Marketing Management”, Pearson Education 2001.
2. Green Paul.E.and Donald Tull, “Research for marketing decisions”, Prentice Hall of India. 1975.
3. Donald S. Tull and Hawkins, “Marketing Reasearch”, Prentice Hall of Inida-1997.
4. Philip Kotler and Gary Armstrong “Principles of Marketing” Prentice Hall of India, 2000.
5. Steven J.Skinner, “Marketing”, All India Publishers and Distributes Ltd. 1998.

17154E44DP RENEWABLE SOURCES OF ENERGY

UNIT– I: FACTORS AFFECTING ENERGY SOURCES: 9

Primary energy sources - world energy resources- energy cycle of the earth –environmental aspects of energy utilisation, CO_2 emissions and Global warming–renewable energy resources and their importance. Potential impacts of harnessing the different renewable energy resources.

UNIT – II: SOLAR ENERGY : 9

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

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

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

UNIT – IV: BIO ENERGY 9

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

UNIT – V: RECENT ADVANCEMENTS 9

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

Total Hours : 45

TEXT BOOKS

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

REFERENCES

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

17154E54BP COMPOSITE MATERIALS

1. INTRODUCTION TO COMPOSITES 8

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

2. POLYMER MATRIX COMPOSITES 12

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

3. METAL MATRIX COMPOSITES 9

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

4. CERAMIC MATRIX COMPOSITES 9

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

5. ADVANCES IN COMPOSITES 7

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

TOTAL : 45

TEXT BOOKS

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

REFERENCES

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

17154E54CP ROBOTICS

UNIT-I: INTRODUCTION OF ROBOT BASICS 7

Robot – Definition – Robot Anatomy – Co-ordinate Systems, Work Envelope, types and classification – Specifications – Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load – Robot Parts and Their Functions – Need for Robots – Different Applications

UNIT-II: ROBOT ACTUATORS AND END EFFECTORS 10

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

UNIT-III: SENSORS AND MACHINE VISION SYSTEM 10

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

UNIT-IV: ROBOT KINEMATICS AND ROBOT PROGRAMMING 10

Forward Kinematics, Inverse Kinematics and Differences; Forward Kinematics and Reverse Kinematics of Manipulators with Two, Three Degrees of Freedom (In 2 Dimensional),
Teach Pendant Programming, Lead through programming, Robot programming Languages – VAL Programming – Motion Commands, Sensor Commands, End effecter commands, and Simple programs

UNIT – V: IMPLEMENTATION AND ROBOT ECONOMICS 8

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

Total Hours : 45

TEXT BOOKS:

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

REFERENCES

1. Fu.K.S. Gonzalz.R.C., and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw-Hill Book Co., 1987

2. Yoram Koren, "Robotics for Engineers", McGraw-Hill Book Co., 1992

3. Janakiraman.P.A., "Robotics and Image Processing", Tata McGraw-Hill, 1995

17154E64AP UNCONVENTIONAL MACHINING PROCESSES

UNIT – I: INTRODUCTION: 5

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

UNIT – II: AJM, WJM & USM 10

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

UNIT – III: EDM 8

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

UNIT – IV: ECM & ECG 12

Chemical Machining and Electro-Chemical machining (CHM and ECM)-Etchants-maskant-techniques of applying maskants-Process Parameters – MRR-Applications.

Principles of ECM-equipments-MRR-Electrical circuit-Process Parameters-ECG and ECH Applications.

UNIT – V: LBM, PAM & EBM 10

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

Total Hours : 45

TEXT BOOKS:

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

REFERENCES:

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

17154E64BP NUCLEAR ENGINEERING

UNIT-I: **NUCLEAR PHYSICS** **9**

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

UNIT-II: NUCLEAR REACTIONS AND REACTION MATERIALS 9

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

UNIT-III: REPROCESSING 9

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

UNIT-IV: NUCLEAR REACTOR 9

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

UNIT-V: SAFETY AND DISPOSAL 9

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

Total Hours : 45

TEXT BOOKS :

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

REFERENCES:

1. Collier J.G., and Hewitt G.F, “Introduction to Nuclear power”, Hemisphere publishing, New York. 1987
2. Wakil M.M.El., “Power Plant Technology” – McGraw-Hill International, 1984.
3.

17154E64CP THERMAL TURBO MACHINES

1. INTRODUCTION TO TURBO MACHINES 9

Turbines, Pumps, Compressors– Stages of Turbo machines – Energy transfer between fluid and rotor – Stage velocity triangles of Thermal Turbo machines – Classification – General energy equation Modified to turbo machines – compression and expansion process – Velocity triangles – Work – T-S and H-S diagram, Total – to – Total and Total – to – Static efficiencies.

2. CENTRIFUGAL FANS AND BLOWERS 9

Definition, selection and classifications –Types of blading design-velocity triangles - Stage Parameters – Flow analysis in impeller blades –Design parameter- Volute and Diffusers – Efficiencies and Losses
Centrifugal Compressors: - Constructional details – Stage velocity triangles –– Stage work – Stage pressure rise – Stage efficiency – Degree of reaction – Slip factor – H-S diagram – Efficiencies

3. AXIAL FANS AND PROPELLERS 9

Definition , classifications – Stage parameters – Types of fan stages
Cascade of blades – Cascade tunnel - Blade geometry-Cascade variables-Energy transfer and loss in terms of lift and drag - Axial Flow Compressors: definition and classifications – Constructional details – Stage velocity triangles, work and pressure rise – H-S diagram – Stage efficiencies and losses- Degree of reaction

4. AXIAL FLOW TURBINES 9

Construction details –90° IFR turbine- Stage work – Stage Velocity triangles – Stage pressure rise – Impulse and reaction stage – Effect of degree of reaction – H-S diagram – Efficiencies and Losses.

5. RADIAL FLOW TURBINES AND WIND TURBINES 9

Constructional details –– Stage velocity triangles – H-S diagram – Stage efficiencies and losses.
Wind turbines: definition and classifications – Constructional details –Horizontal axis wind turbine- Power developed – Axial thrust – Efficiency.

TOTAL : 45

TEXT BOOKS

1. Yahya, S.H., "Turbines, Compressors and Fans", Tata McGraw-Hill Publishing Company, 1996.

2. Dixon S.L "Fluid Mechanics, Thermodynamics of turbomachines"-2nd Edition, Pergamon press 1990.
3.

REFERENCES

1. Kadambi V and Manohar Prasad- "An Introduction to energy conversion - Vol. III", Turbomachines- Wiley Eastern India Ltd, 1977.

17160E74CP PRINCIPLES OF MANAGEMENT
(COMMON TO ALL BRANCHES)

UNIT I - Nature of Management 9

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

UNIT II - Development of Management Thought 9

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

UNIT III - Planning and organizing 9

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

UNIT IV - Direction and Coordination 9

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

UNIT V – Controlling 9

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

Total Hours: 45

Textbooks:

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

References:

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

17154E74DP INDUSTRIAL ENGINEERING

Unit I Introduction to Industrial Engineering

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

Unit II Plant layout

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

Unit III - Material handling

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

Unit IV Organization,

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

Unit V Labour welfare and Industrial Safety

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

References:

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

PRIST Deemed to be University

VALLAM, THANJAVUR.

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAMME HANDBOOK

M.Tech. – Manufacturing Technology

FULL TIME PROGRAMME

Regulation 2017

(For candidates admitted to M.Tech Manufacturing Technology programme from June 2013 onwards)

COURSE STRUCTURE

Semester 1

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17248S11E	Advanced Engineering Mathematics	3	1	-	4
17254H12	Theory of Metal Cutting	3	1	-	4
17254H13	Advanced Manufacturing Processes	4	-	-	4
17254H14	Mechanical Metallurgy	4	-	-	4
17254H15	Automated Computer Integrated Manufacturing Systems	4	-	-	4
17254E16 (A To C)	Elective - I	4	-	-	4
17254HRS	Research Led Seminar	4	-	-	1
17254L17	CIM Lab	-	-	3	3
TOTAL NO. OF CREDITS					**28**

Semester 2

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254H21	Production Management	3	1	-	4
17254H22	MEMS and Nano Technology	4	-	-	4
17254H23	Manufacturing Metrology and Quality Control	3	1	-	4
17254E24 (A to C)	Elective - II	4	-	-	4
17254E25 (A to C)	Elective - III	4	-	-	4
17254HRM	Research Methodology	4	-	-	3
17254HBR	Participation in Bounded Research	1	-	-	2
17254L26	Automation Lab	-	-	3	3
172TECWR	Technical Writing/Seminar	-	-	3	3
TOTAL NO. OF CREDITS					**31**

Semester 3

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254H31	Metal Forming Process	4	-	-	4

17254E32 (A to C)	Elective - IV	4	-	-	4
17254E33 (A to B)	Elective - V	4	-	-	4
17254E34 (A to B)	Elective - VI	4	-	-	4
17254HSR	Design Project /SOCIO Technical Project (scaffolded Research)	4	-	-	4
17254P35	Project Work Phase I	-	-	6	6
TOTAL NO. OF CREDITS					**26**

Semester 4

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
17254P41	Project Work Phase II	-	-	12	12
TOTAL NO. OF CREDITS					**12**

ELECTIVE -I

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
17254E16A	Materials Management and Logistics	4	-	-	4
17254E16B	Tolerance Technology	4	-	-	4
17254E16C	Terotechnology	4	-	-	4

ELECTIVE -II

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
17254E24A	Manufacturing of Products from Non-metallic Materials	3	1	-	4
17254E24B	Lean Manufacturing	4	-	-	4
17254E24C	Project Management	3	1	-	4

ELECTIVE -III

Course Code	Title of Paper	L	T	P	C
17254E25A	Fracture Mechanics and Mechanisms	4	-	-	4
17254E25B	Maintenance Management	4	-	-	4
17254E25C	Theory of Plasticity	3	1	-	4

ELECTIVE -IV

17254E32A	Tool Engineering and Design	4	-	-	4
17254E32B	Instrumentation and Control Engineering	4	-	-	4
17254E32C	Polymers and Composite Materials	3	1	-	4
17254E32D	Quantitative decision Making	4	-	-	4

ELECTIVE -V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E33A	Data Analytics	4	-	-	4
17254E33B	Fluid Power Automation	4	-	-	4
17254E33C	Advanced Heat Treatment Of Metals	4	-	-	4

ELECTIVE -VI

17254E34A	Advanced Material Technology	4	-	-	4
17254E34B	Entrepreneurship Development	4	-	-	4
17254E34C	Modelling and Simulation	4	-	-	4

Total No of Credits - 97

PRIST Deemed to be UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

M.TECH., MANUFACTURING TECHNOLOGY – FULL TIME PROGRAMME SYLLABI-REGULATIONS- 2017

I - SEMESTER

17248S11E - ADVANCED ENGINEERING MATHEMATICS 3 1 0 4

LAPLACE TRANSFORM:

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

FOURIER TRANSFORM

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

PROBABILITY OF DISTRIBUTION

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

TESTING OF HYPOTHESIS

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

THEORY OF ESTIMATION

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

BOOKS FOR REFERENCES:

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and LIberman
4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999.

17254H12 - THEORY OF METAL CUTTING 3 1 0 4

OBJECTIVE:

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

UNIT- I: Orthogonal Cutting:

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

UNIT-II: Chip Formation:

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

UNIT-III : Tool Life and Machinability:

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

UNIT-IV: Thermal Analysis in Metal Cutting:

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

UNIT-V: Chatter:

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

BOOKS FOR REFERENCES:

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

17254H13

ADVANCED MANUFACTURING PROCESSES 4
0 0 4

AIM:

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

OBJECTIVE:

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

UNIT I NEWER MACHINING PROCESSES - I 9

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

UNIT II NEWER MACHINING PROCESS – II 9

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

UNIT III NEWER MACHINING PROCESS – III 9

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

UNIT IV FABRICATION OF MICRO DEVICES 9

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

UNIT V MICROFABRICATION TECHNOLOGY 9

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

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

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

17254H14 MECHANICAL METALLURGY 4 0 0 4

OBJECTIVE:

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

UNIT-I: Tensile Study:

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

UNIT-II: Hardness and Toughness:

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

UNIT-III: Fatigue:

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

UNIT-IV: Fracture Behaviour:

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

UNIT-V: Creep:

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

.

BOOKS FOR REFERENCES:

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

17254H15 AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS 4 0 0 4

AIM:

To stress the role of computers in production.

OBJECTIVE:

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

UNIT I INTRODUCTION 6

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

UNIT II AUTOMATED MANUFACTURING SYSTEMS 10

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

UNIT III GROUP TECHNOLOGY AND FMS 10

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

UNIT IV PROCESS PLANNING 10

Process planning – Activities in process planning, Information's required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes – selecting among casting process, forming process and machining process. Sequencing of operations according to Anteriorities – various examples – forming of Matrix of Anteriorities – case study. Typical process sheet – case studies in Manual process planning. Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning.

UNIT V TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE 9

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

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

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

17254L17

CIM LAB 0 0 3 3

AIM:

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

OBJECTIVES:

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

CAM LABORATORY

1. Exercise on CNC Lathe: Plain Turning, Step turning, Taper turning, Threading, Grooving & canned cycle
2. Exercise on CNC Milling Machine: Profile Milling, Mirroring, Scaling & canned cycle.
3. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.

4. Mini project on any one of the CIM elements is to be done. This can be either a software or hardware simulating a CIM element. At the end of the semester, the students has to submit a mini report and present his work before a Committee.

CAD LABORATORY

2D modeling and 3D modeling of components such as

1. Bearing
2. Couplings
3. Gears
4. Sheet metal components
5. Jigs, Fixtures and Die assemblies.

TOTAL: 30 PERIODS.

SEMESTER II

17254H21 PRODUCTION MANAGEMENT 3 1 0 4

OBJECTIVE:

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

UNIT-I : Manufacturing System: 8

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

UNIT-II : Aggregate Planning : 7

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

UNIT-III: Inventory Management Systems and Models 10

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

UNIT-IV: MRP & JIT: 10

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

UNIT-V: Scheduling: 10

Scheduling and assignment problems - notation and definitions - criteria, objective functions for scheduling - job shop scheduling: sequencing of n job s thorough 1 machine - priority rules, n jobs through 3, m machines - Johnsons rule, CDS algorithm, 2 jobs on m machine - graphical method- multi product assignment problem - index method, Hungarian method.

TEXT BOOKS:

1. Production Operation Management:Theory And Problems, Chary:S.N, TMH, New delhi,1990.
2. Production Operation Management, Pannerselvam.R, PHI, 1999.

REFERENCE BOOKS:

1. Operation Management Theory And Problems, Monks.J,G., McGraw HILL,1987.

2. Production operation management, chase.R.B,. Aquiliano.N.J and Jacobs.R.R.,8th Edition, TMH, 1988.

3. Production Planning And Inventory Control, Narashimhan. S.L., Mcleavy.D.W.,and Billington.P.J., 2nd Edition., PHI,1997

17254H22 **MEMS AND NANO TECHNOLOGY 4 0 0 4**

AIM:

To inspire the students to expect to the trends in manufacturing micro components and measuring systems to nano scale.

OBJECTIVES:

• To expose the students to the evolution of micro electromechanical systems, to the various fabrication techniques and to make students to be award of micro actuators.

• Also to impart knowledge to the students about nano materials and various nano measurements techniques.

UNIT I OVER VIEW OF MEMS AND MICROSYSTEMS 6

Definition – historical development – fundamentals – properties, micro fluidics, design and fabrication micro-system, microelectronics, working principle and applications of micro system.

UNIT II MATERIALS, FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING 10

Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds silicon piezo resistors, Galium arsenide, quartz, polymers for MEMS, conductive polymers. Photolithography, photo resist applications, light sources, in implantation, diffusion process exudation – thermal oxidation, silicon diode, chemical vapour deposition, sputtering - deposition by epitoxy – etching – bulk and surface machining – LIGA process Micro system packaging – considerations packaging – levels of micro system packaging die level, device level and system level.

UNIT III MICRO DEVICES AND MATERIALS 8

Sensors – classification – signal conversion ideal characterization of sensors micro actuators, mechanical sensors – measurands displacement sensors, pressure and flow sensors, micro actuators – smart materials – applications.

UNIT IV SCIENCE OF NANO MATERIALS 10

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.

UNIT V CHARACTERIZATION OF NANO MATERIALS 11

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Tai – Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.
2. Mark Madou Fundamentals of Microfabrication, CRC Press, New York, 1997.
3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003
4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.
5. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003
6. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

17254H23 MANUFACTURING METROLOGY AND QUALITY CONTROL 3 1 0 4

AIM:

To expose the students, the importance of measurement and the various latest measuring techniques using Laser, Coordinate measuring machines and Optoelectronics devices. Also to stress upon the Importance of quality in manufacturing.

OBJECTIVES:

To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices. Also to make the students to understand quality

UNIT – I LASER METROLOGY 8

Introduction – types of lasers – laser in engineering metrology – metrological laser methods for applications in machine systems – Interferometry applications – speckle interferometry – laser interferometers in manufacturing and machine tool alignment testing – calibration systems for industrial robots laser Doppler technique – laser Doppler anemometry.

UNIT – II PRECISION INSTRUMENTS BASED ON LASER 9

Laser telemetric systems – detection of microscopic imperfections on high quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high inertia laser scan technique – rotating mirror technique – laser gauging – bar coding – laser dimensional measurement system.

UNIT – III CO-ORDINATE MEASURING MACHINE 10

Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors – displacement devices – Performance Evaluations – Software – Hardware – Dynamic errors – Thermal effects diagram – temperature variations environment control – applications.

UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 9

Opto electronic devices – CCD – On-line and in-process monitoring in production – applications image analysis and computer vision – Image analysis techniques – spatical feature – Image extraction – segmentation – digital image processing – Vision system for measurement – Comparison laser scanning with vision system.

UNIT – V QUALITY IN MANUFACTURING ENGINEERING 9

Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

TOTAL: 45 PERIODS

REFERENCES:

1. John A. Bosch, Giddings and Lewis Dayton, Co-ordinate Measuring Machines and Systems, Marcel Dekker, Inc, 1999.
2. Juran J.M. and Gyna F.M., Quality Planning and Analysis, Tata-McGraw Hill, New Delhi
3. Zuech, Nello Understanding and Applying Machine Vision, Marcel Dekker, Inc, 2000
4. Elanchezhian.C, Vijaya Ramnath.B and Sunder Selwyn, T., Engineering Metrology, Eswar Press, Chennai, 2004.

17254L26
AUTOMATION LAB **0 0 3 3**

AIM:

To impart knowledge in the area of hydraulic and pneumatic components and its functions.

OBJECTIVE:

• To make the students to learn the basic concepts of hydraulics and pneumatics and its applications in the area of manufacturing process.
• To simulate the various hydraulics and pneumatics circuits.

EXPERIMENTS:

1. Simulation of single and double acting cylinder circuits
2. Simulation of Hydraulic circuits
3. Simulation of electro pneumatic circuits
4. Simulation of electro hydraulic circuits
5. Simulation of PLC circuits
6. Exercises on linear and angular measurements
7. Exercises on speed measurements
8. Exercises on Vibration measurements
9. Exercises on Motion controller using servo motors, encoders, etc.
10. Exercises on fiber optics transducers.
11. Exercises on stepper motor.
12. Exercises on microprocessor based data acquisition system.
13. Software simulation of fluid power circuits using Automation studio.

TOTAL : 30 PERIODS

172TECWR Technical Writing/Seminar: 0 0 3 3

Seminar should be based on the literature survey on any topic relevant to CAD/CAM/CAE. It may be leading to selection of a suitable topic of dissertation. The report shall contain some contribution by the candidate in the form of experimental results, deductions, compilation and inferences etc.

• Each student has to prepare a write-up of about 25 pages. The report typed on A4 sized sheets and bound in the necessary format should be submitted after approved by the guide and endorsement of the Head of Department.

• The student has to deliver a seminar talk in front of the teachers of the department and his classmates. The Guide based on the quality of work and preparation and understanding of the candidate shall do an assessment of the seminar.

Research Methodology

AIM:

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in basic computational and excel- skills for research in engineering.

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I

Introduction to Research — Criteria of Good Research, Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem-Basic principles of experimental designs-Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and Scaling – Different scales. Ethics & Misconduct in research, Plagiarism,

UNIT II

Formulation of Hypothesis – Sampling techniques –Sampling error and sample size-Methods of data collection – Primary and secondary data – observation – Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection- Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis.

UNIT III

Data Analysis using Excel- Tabulation of Data in excel (Creating Master Table and Sub Table), Formulas and Functions, Filters and Sort and Validation Lists, Data from External Sources. Data Analysis Using Charts and Graphs(Pivot Table & Charts), Time Value of Money, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, regression lines. Z-test, t- test F-test, ANOVA one way classification, Chi square test, independence of attributes. Time series: forecasting Method of least squares, Moving average method, Introduction to presentation tool, features and functions, Creating Presentation, Customizing presentation.

UNIT IV

Various research methods-Design of Experiments, Response Surface Methodology, Taguchi Methods- Modeling & Simulation of Engineering Systems, Artificial Neural Networks, Fuzzy Logic, MATLAB - Graph Theory- Finite Element Methods, Computational Fluid Dynamics -R programming in Statistics- open source software

UNIT V

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM Vidyalaya Press.

3. R.A Day and A.L. Underwood, Quantitative analysis, Prentice Hall, 1999.

4. R. Gopalan, Thesis writing, Vijay Nicole Imprints Private Ltd., 2005.

5. W.J. DeCoursey, Statistics and Probability for Engineering Applications With Microsoft® Excel, Newnes, 2003.

6. Archibald Fripp, Jon Fripp, Michael Fripp; Just-in-Time Math for Engineers, Elsevier Science & Technology Books, 2003.

SEMESTER III

17254H31

METAL FORMING PROCESS 4 0 0 4

OBJECTIVE:

To study about the response of materials under plastic deformation and the various techniques for finding the stress for various metal working processes, and the recent developments in high speed forming.

UNIT-I: Stress and Strain: 8

Stress-State of stress in two dimensions – three dimensions – stress tensor-Mohr's circles – 2D and 3D state of stress – Description of strain at a point – Mohr's circle of strain- Hydrostatic and stress deviator component of stress- Plasticity- flow curve- true and true strain yield criteria for ductile loads combined stress test-plastic stress and strain relations- Levy Mises equations-Prandyl_Resus equations.

UNIT-II: Analysis of Metal Forming: 10

Work Load analysis – work formula for homogeneous deformation- rolling, rod drawing and extrusion processes -Determination of load by stress evaluation method-Determination of drawing load – strip drawing with wedge shaped dies and cylindrical rod drawing with a conical die.

UNIT-III: Stress Evaluation: 9

Stress evaluation method-Determination of forging load-plane strain forging of a thin strip and a flat circular disc- Determination of extrusion load for round band flat strip- upper bound analysis – plane strain indentation with frictionless interface

UNIT-IV: High velocity Forming: 9

Study of effect of high speed on stress strain relationships- High velocity forming equipment- Description of high speed forming machine – hot forging, pneumatic-mechanical, high velocity forging – Fuel combustion process- Electro magnetic forming –Introduction- Procedure - process variables- Applications

UNIT-V: Advanced Forming process: 9

Explosive Forming – Explosives – characteristics- stand off and contact operations- stress waves and their effects- process variables – properties of formed components- applications- Electro hydraulic forming – principles, requirements and characteristics – process variables- water hammer forming- principles and parameters- governing the process.

BOOKS FOR REFERENCES:

1. George E.Dieter, "Mechanical Metallurgy", Mc Graw Hill International Edition, New York,1988
2. Rowe G.W,Edward , "An Introduction to the Principles of Metal Working", Edward Arnold publications.
3. Davies.R and Austin.E.R, "Developments in High Metal Forming", The Machinery Publishing Co.Ltd

List of Electives - Elective I

17254E16A MATERIALS MANAGEMENT AND LOGISTICS 4 0 0 4

AIM:

To introduce to the students the various functions of materials management and logistics

OBJECTIVE:

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

UNIT I INTRODUCTION 6

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II MANAGEMENT OF PURCHASE 7

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

UNIT III MANAGEMENT OF STORES AND LOGISTICS 12

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

UNIT IV MATERIALS PLANNING 10

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

UNIT V INVENTORY MANAGEMENT 10

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45

BOOKS FOR REFERENCES:

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. Guptha P.K. and Manmohan, Problems in Operations Research, Suttan Chand & Sons, 2003.

4. Dr.R. Kesavan, C.Elanchezian and B.Vijaya Ramnath, Production Planning and Control, Anuratha Publications, Chennai, 2008.
5. G. Reghuram, N. Rangaraj, Logistics and supply chain management – cases and concepts, Macmillan India Ltd., 2006.

17254E16B TOLERANCE TECHNOLOGY

(Use of approved design data book is permitted in the examination)

UNIT I

Limits, fits and tolerance - hole basis and shaft basis system, quality engineering based product development process.

UNIT II

Interpretation, inspection and application of form tolerances - datum system and targets – tolerance of position.

UNIT III

Fundamentals of descriptive statistics and inferential statistics - use of distributions - Taguchi approach - tolerance analysis.

UNIT IV

Tolerance stack analysis and allocation - linear and non-linear stack analysis - worst case tolerance analysis - computer aided tolerance technique – cost based optimal tolerance analysis - tolerance allocation methods

UNIT V

Tolerance charting - blue print dimensions - machining allowances - datum features - functional and manufacturing datum - exercises.

REFERENCES

1. ASME "study manual on tolerance stacks", Vol I, Second edition 1994.
2. ASME self study workbook on GD & T second edition 1994.
3. Spotts,, "Dimensioning and tolerancing of mass production", Prentice Hall, 1983

17254E16C **TEROTECHNOLOGY**

UNIT I
Probability concepts – Probability distributions – density and distribution functions for uniform, exponential, razeligh, weibull, normal distribution

UNIT II
Non-maintained systems – Reliability definition and its important

UNIT III
Method of improving reliability redundancy techniques

UNIT IV
failure data analysis – Reliability models –

UNIT V
Maintenances systems and economics of reliability - Maintenance and spares management - preventive replacement - Condition monitoring & analysis.

REFERENCES
1. Srinath L S,, "Reliability Engineering", East West Press Pvt Ltd, 1991.
2. Collact, "Mechanical Fault Diagnosis and Condition Monitoring", 1997.
3. Balagurusamy, "Reliability Engineering", Tata Mc Graw Hill,1984.

List of Electives - Elective II

17254E24A MANUFACTURING OF PRODUCTS FROM NON METALIC MATERIALS

UNIT I

Polymers - molding of thermoplastics - plastic sheet forming process - machining of thermoplastics - Thermosetting plastics - properties, molding processes and machining - other processing methods for plastics - plastic component design.

UNIT II

Rubber: Manufacturing process - Manufacturing techniques, materials design, sizing, components, building, moulding and vulcanising of tyres - Belting – manufacture and types of hose.

UNIT III

Types, processing and manufacturing techniques of Glass vessels.

UNIT IV

Ceramic materials - Processing of ceramic products.

UNIT V

Composite matearials, Fiber, particulate, whisker reinforced ceramics, properties of reinforcements and matrix. Manufacturing Techniques and applications of different Composites namely PMC, MMC and CMC.

REFERENCES

1. Blow C M,, "Rubber Technology and Manufacturing", Newman Butterworths, 1977.
2. Hasle Hurst, "Manufacturing Technology", ELBS, 1973.
3. Vanviack L.H, "Physical Ceramics for Engineers", Addision Wesley Publicxation, 1964.

17254E24B LEAN MANUFACTURING 4 0 0 4

AIM:

To introduce the concepts of lean manufacturing system.

OBJECTIVES:

- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.

UNIT – I INTRODUCTION TO LEAN MANUFACTURING 7

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

UNIT – II CELLULAR MANUFACTURING, JIT, TPM 9

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT – III SET UP TIME REDUCTION, TQM, 5S, VSM 10

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT – IV SIX SIGMA 9

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

UNIT – V CASE STUDIES 10

Various case studies of implementation of lean manufacturing at industries.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003
2. Rother M. and Shook J, 1999 ‘Learning to See: Value Stream Mapping to Add Value and Eliminate Muda’ , Lean Enterprise Institute, Brookline, MA.
4. Mikell P. Groover (2002) ‘Automation, Production Systems and CIM.

17254E24C PROJECT MANAGEMENT

UNIT-I

Introduction: Introduction to Project Management, History of Project Management, Project Life Cycle.
Project Analysis: Facets of Project Analysis, Strategy and Resource Allocation, Market and Demand Analysis, Technical Analysis, Economic and Ecological Analysis.

UNIT-II

Financial Analysis: Financial Estimates and Projections, Investment Criteria, Financing of Projects

UNIT-III

Network Methods in PM: Origin of Network Techniques, AON and AOA differentiation, CPM network, PERT network, other network models.

UNIT-IV

Optimization in PM: Time and Cost trade-off in CPM, Crashing procedure, Scheduling when resources are limited.

UNIT-V

Project Risk Management: Scope Management, Work Breakdown Structure, Earned Value Management, Project Risk Management.

Text Books:

1. Project: A Planning Analysis, Prasanna Chandra, Tata McGraw Hill Book Company, New Delhi, 4th Edition,2009.
2. Project Management, Cleland, Gray and Laudon, Tata McGraw Hill Book Company, New Delhi, 3rd Edition, 2007.
3. Larson Project Management , Clifford F. Gray, Gautam V. Desai, Erik W., Tata McGraw-Hill Education, 2010

List of Electives - Elective III

17254E25A FRACTURE MECHANICS AND MECHANISMS

UNIT-I

Introduction sources of micro and macro cracks fracture criterion based on stress concentration and theoretical strength Griffith's energy - various approach - Stress Analysis for Members with Cracks.

UNIT-II

Crack tip Plastic Zone: Plastic zone estimation - yielding fracture mechanics.

UNIT-III

Elastic–Plastic Fracture Mechanics - Path-independent integrals, J-integral , J-integral fracture criterion, crack opening displacement(COD), experimental determination of Jintegral and COD - Fatigue and Fatigue crack growth rate.

UNIT -IV

Linear static fracture Mechanics Design Concepts - Introduction, the stress criterion, strain energy density, 2-D linear elastic crack problems.

UNIT-V

Dynamic Fracture: Mohr's model, strain energy release rates, crack branching, practical applications of crack arresting techniques. Experimental determination of dynamic SIF. - NDT and Fracture Mechanics

REFERENCES

1. S.A. Maguid,, "Engineering Fracture Mechanics", Elsevier, 1996
2. David Broke., "Elementary Engineering Fracture Mechanics", Noordhoff, 1995.

*3. Karen Hellan, "Introduction to Fracture Mechanics", Mc Graw Hill, 1982.*6. MILAN SONKA, VACLAV HLAVAC and ROGER BOYLE, "Image Processing, Analysis, and Machine Vision", Cengage-Engineering; 3 edition (March 19, 2007).

17254E25B MAINTENANCE MANAGEMENT 4 0 0 4

OBJECTIVE:

To understand the concepts of maintenance management and to have knowledge in developing a suitable maintenance system for any type of an organization.

UNIT I: Introduction to Maintenance Management: 7

Maintenance: Its role and scope in total Organizational contexts - role of Maintenance. Centralized and decentralized maintenance organization structures. Maintenance Economics – reliability and Availability – MTBF, MTTR.

UNIT II: Maintenance Categories: 10

Maintenance system– Categories - Design and its selection – Breakdown Maintenance –Routine Maintenance- Predictive Maintenance –Preventive Maintenance- Corrective Maintenance-Total Productive Maintenance –Maintenance Schedule – Repair Cycle.

UNIT III: Spare Parts Management: 8

Pareto's principles for repetitive breakdown analysis, spares management, planning considerations for each type of activities.

UNIT – IV: Condition Monitoring: 10

Condition Monitoring (CM) – Introduction- Economics of CM – On-load and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

UNIT V: Maintenance Manpower Cost, Performance Management: 10

Maintenance man power planning - Selection training - Scheduling maintenance costs - Budget preparation and budgetary control of maintenance expenditures Maintenance effectiveness various performance indices - evaluation, uses and limitations - Monitoring of Maintenance performance.

TEXT BOOKS FOR REFERENCES:

1. Gopalakrishnan P. and Sundarajan 1996. Maintenance Management. New Delhi, Prentice-Hall of India.
2. Srivastava S.K., "Industrial Maintenance Management", - S. Chand & Co.,1981.
3. Higgirs L.T and Morrow L.C., 1997, ``Maintenance Engineering Handbook``, McGraw Hill.
Armstrong, "Condition Monitoring", BSIRSA, 1988.

17254E25C THEORY OF PLASTICITY

UNIT-I

Iinvariance in terms of the deviatoric stresses, representative stress - Engineering and natural strains, cubical dilation, finite strains co-efficients, Octahedral strain, strain rate and the strain rate tensor.

UNIT-II

Yield criteria for ductile metal - Yield criteria for an anisotropic material. Stress – Strain Relations – Plastic stress-strain relations, Prandtl Roeuss Saint Venant, Levy – Von Mises, Yield locus, symmetry convexity, normality rule.

UNIT-III

Application to problems, simple forms of indentation problems using upper bounds. Problems of metal forming.

UNIT-IV

Crystal Plasticity, the crystalline state, crystallographic indices, the preferential planes and directions, critical shear stress, theory of simultaneous slip, slip bands, the plastic bending in crystals, dislocations and crystal growth, polycrystals and grain boundaries,

UNIT-V

Plane plastic strain and the theory of the slip line filed, two dimensional problems of steady and non steady motion, plastic anisotropy.

REFERENCES

1. Narayanasamy R, "Theory of Engineering Plasticity", Ahuja Publications, 2000.
2. Johnson and Mellor, "Plasticity for Mechanical Engineers", Ban Nostrand, 1973.
3. R.Hill , "The Mathematic theory of Plasticity", Oxford Publication, 1982.

List of Electives - Elective IV

17254E32A TOOL ENGINEERING AND DESIGN

UNIT-I
Introduction to manufacturing processes – objectives, organization and role of tool engineering – role of materials in tooling.

UNIT-II
Tooling for material removal process like traditional machining processes, nontraditional machining processes automats and NC and CNC machines.

UNIT-III
Tooling for forming processes.

UNIT-IV
Tooling for casting and metal joining processes – molding and pattern design mechanization of foundries Design of welding fixtures – tooling for mechanical joining processes.

UNIT-V
Tooling for inspection and gauging – design and manufacturing of gauges – CMM – CAD in tool design.

REFERENCES
1. Hoffman E.G, "Fundamentals of tool design", SME, 1984.
2. Kalpakjian S., "Manufacturing Engineering and Technology", Addision Wesley, 1995.
3. HMT "Production Technology", Tata McGraw Hll, 1991.

17254E32B INSTRUMENTATION AND CONTROL ENGINEERING 4 0 0 4

UNIT–I: Introduction to Instrumentation: 8
Mechanical Instrumentation- General concepts, General measurement system. Classification of Instruments - indicators, recorders and integrators- working principles, Precision and Accuracy: Measurement Error and calibration.

UNIT–II: Measuring Devices 10
Measurement of speed, frequency, acceleration - Vibrometer, Accelerometer etc. Pressure measurement: Gravitational, Bourdon, elastic transducers, strain gauge, pressure cells, and measurement of high and low pressure. Temperature measurement: Bi-Metallic, Resistance Thermometer, Thermocouples, Pyrometer, thermostats, Magnetic flow meter , Ultrasonic flow meter.

UNIT – III: Transducers: 8
Transducers – Introduction – Types -Variable resistance Transducers-Variable reactive transducers- Piezo Electric transducers- Fibre optic transducers- Laser instrumentation-analogue and digital type -incremental and absolute measurement.

UNIT – IV: Machine Diagnostic and Condition Monitoring: 10
Machine Diagnostics – Basic Concepts - Analysis of failure in machines-Distribution of fault occurrences-Objectives of monitoring-Monitoring techniques applied to Machineries.

UNIT – V: Computer Control System: 9
Data acquisition system-Introduction-Direct Digital control-Programmable Logic Controls (PLC) -Ladder diagrams-Communication used in PLC.

BOOKS FOR REFERENCES:
1. Thomas Beckwith, Lewis Buck N.Ray, D. Maragoni, “Mechabical Measurements”, Narosia Publishing House, NewDelhi.
2. M.P.Groover - " Automation, Production Systems and computer Intergrated Manufacturing ", Prentice Hall.
3. A.K. Sawhney, “Elecrical and Electronics Measurements & Instrumentation”, Dhanpat Rai & Sons, 1993
4. C.S.Rangan,V.S.V.Mani and G.R.Sarma - " Instrumentation Devices and systems", Tata McGraw Hill,1983

17254E32C POLYMERS AND COMPOSITE MATERIALS 4004
UNIT I PROCESSING OF POLYMERS
9

Chemistry and Classification of Polymers – Properties of Thermo plastics – Properties of Thermosetting Plastics - Extrusion – Injection Moulding – Blow Moulding – Compression and Transfer Moulding – Casting – Thermo Forming. General Machining properties of Plastics – Machining Parameters and their effect – Joining of Plastics – Thermal bonding – Applications.

UNIT II FIBERS AND MATRIX MATERIALS 9
Fibers – Fabrication, Structure, properties and applications – Glass fiber, Boron fiber, carbon fiber, organic fiber, ceramic and metallic fibers - whiskers–Fabrication of Matrix materials – polymers, metals and ceramics and their properties – interfaces – Wettability – Types of bonding at the interface – Tests for measuring interfacial strength - Physical and chemical properties.

UNIT III PROCESSING OF POLYMER MATRIX COMPOSITES 9
Thermoset matrix composites: hand layup, spray, filament winding, Pultrusion, resin transfer moulding, autoclave moulding - bag moulding, compression moulding with Bulk Moulding Compound and sheet Moulding Compound – thermoplastic matrix composites – film stacking, diaphragm forming, thermoplastic tape laying, injection moulding – interfaces in PMCs - structure, properties and application of PMCs –recycling of PMCs.

UNIT IV PROCESSING OF METAL MATRIX COMPOSITES 9
Metallic matrices: aluminium, titanium, magnesium, copper alloys – processing of MMCs: liquid state, Solid state, in situ fabrication techniques – diffusion bonding – powder metallurgy techniques- interfaces in MMCs – mechanical properties – machining of MMCs – Applications.

UNIT V PROCESSING OF CERAMIC MATRIX COMPOSITES AND CARBON-CARBON COMPOSITES 9
Processing of CMCs: cold pressing, sintering, reaction bonding, liquid infiltration, lanxide process – in situ chemical reaction techniques: chemical vapour deposition, chemical vapour impregnation, sol-gel – interfaces in CMCs – mechanical properties and applications of CMCs – Carbon-carbon Composites – applications.

TOTAL HOURS: 45

OUTCOMES:
At the end of this course the students are expected
 To study matrix material, reinforcements of polymer matrix composites, MMC and ceramic matrix composites.
 To develop knowledge on processing, interfacial properties and application of composites.

REFERENCES:
1. ASM Handbook – Composites, Vol-21, 2001, ISBN: 978-0-87170-703-1.
2. Harold Belofsky, Plastics, Product Design and Process Engineering, Hanser Publishers, 2002.
3. Jamal Y. Sheikh-Ahmad, Machining of Polymer Composites, Springer, USA, 2009. ISBN: 978-0-387-35539-9.
4. Krishnan K Chawla, Composite Materials: Science and Engineering, International Edition, Springer, 2012, ISBN:978-0-387-74364-6.
5. Mallick P.K., Fiber Reinforced Composites: Materials, Manufacturing and Design, CRC press, New Delhi, 2010, ISBN:0849342058.
6. Mallick, P.K. and Newman.S., Composite Materials Technology, Hanser Publishers, 2003.

List of Electives - Elective V

17254E33A DATA ANALYTICS

UNIT I INTRODUCTION TO BIG DATA 8

Introduction to Big Data Platform – Challenges of conventional systems - Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools, Stastical concepts: Sampling distributions, resampling, statistical inference, prediction error.

UNIT II DATA ANALYSIS 12

Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics – Rule induction – Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT III MINING DATA STREAMS 8

Introduction to Streams Concepts – Stream data model and architecture – Stream Computing, Sampling data in a stream – Filtering streams – Counting distinct elements in a stream – Estimating moments – Counting oneness in a window – Decaying window – Realtime Analytics Platform(RTAP) applications - case studies – real time sentiment analysis, stock market predictions.

UNIT IV FREQUENT ITEMSETS AND CLUSTERING 9

Mining Frequent itemsets – Market based model – Apriori Algorithm – Handling large data sets in Main memory – Limited Pass algorithm – Counting frequent itemsets in a stream – Clustering Techniques – Hierarchical – K- Means – Clustering high dimensional data – CLIQUE and PROCLUS – Frequent pattern based clustering methods – Clustering in non-euclidean space – Clustering for streams and Parallelism.

UNIT V FRAMEWORKS AND VISUALIZATION 8

MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases – S3 – Hadoop Distributed file systems – Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications:

TOTAL : 45 PERIODS

OUTCOMES:

At the end of this course the students are expected to

 Apply the statistical analysis methods.

 Compare and contrast various soft computing frameworks.

 Design distributed file systems.

 Apply Stream data model.

 Use Visualisation techniques

REFERENCES:

1. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge
Big Data Glossary, O‟Reilly, 2011.

2. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analystics, John Wiley & sons, 2012.
3. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden,
4. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.
5. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
University Press, 2012.

17254E33B FLUID POWER AUTOMATION

AIM:

To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

OBJECTIVE:

• To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.

• To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

UNIT I INTRODUCTION 5

Need for Automation, Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.

UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS 8

Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators – standard circuit symbols, circuit (flow) analysis.

UNIT III CONTROL AND REGULATION ELEMENTS 8

Direction flow and pressure control valves-Methods of actuation, types, sizing of ports pressure and temperature compensation, overlapped and under lapped spool valves operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

UNIT IV CIRCUIT DESIGN 10

Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.

UNIT V ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS 7

Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Antony Esposito, Fluid Power Systems and control Prentice-Hall, 1988.
2. Peter Rohner, Fluid Power logic circuit design. The Macmillan Press Ltd.,London, 1979
3. E.C.Fitch and J.B.Suryaatmadyn. Introduction to fluid logic, McGraw Hill, 1978.
4. W.Bolton, Mechatronics, Electronic control systems in Mechanical and Electrical Engineering Pearson Education, 2003.
5. Peter Rohner, Fluid Power Logic Circuit Design, Mcmelan Prem, 1994.

List of Electives - Elective VI

17254E34A ADVANCED MATERIAL TECHNOLOGY 4 0 0 4

AIM:

To impart knowledge on advance concepts of material technology

OBJECTIVE:

- To enlight the PG students on elastic, plastic and fractured behaviour of engineering Materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

UNIT I ELASTIC AND PLASTIC BEHAVIOR 10

Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

UNIT II FRACTURE BEHAVIOUR 10

Griffith's theory, stress intensity factor and fracture toughness – Toughening mechanisms – Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law. Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

UNIT III SELECTION OF MATERIALS 10

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

UNIT IV MODERN METALLIC MATERIALS 8

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nano crystalline materials.

UNIT V NON METALLIC MATERIALS 7

Polymeric materials – Formation of polymer structure – Production techniques of fibers, foams, adhesives and coating – structure, properties and applications of engineering polymers – Advanced structural ceramics, WC, TIC, TaC, Al2O3, SiC, Si3N4 CBN and diamond – properties, processing and applications.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
2. Thomas H. Courtney, Mechanical Behaviour of Materials, (2nd edition), McGraw Hill, 2000.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4^{th} Edition) Jaico, 1999.

4. ASM Hand book, Vol.11, Failure Analysis and Prevention, (10th Edition), ASM, 2002.
5. Ashby M.F., Material Selection in Mechanical Design, 3rd Edition, Butter Worth 2005.

17254E34B ENTREPRENEURSHIP DEVELOPMENT

UNIT I ENTREPRENEURSHIP 9
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurical Growth.

UNIT II MOTIVATION 9
Major Motives Influencing an Entrepreneur – Achievement Motivation Training, self Rating, Business Game, Thematic Apperception Test – Stress management, Entrepreneurship Development Programs – Need, Objectives.

UNIT III BUSINESS 9
Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT IV FINANCING AND ACCOUNTING 9
Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, management of working Capital, Costing, Break Even Analysis, Network Analysis Techniques of PERT/CPM – Taxation – Income Tax, Excise Duty – Sales Tax.

UNIT V SUPPORT TO ENTREPRENEURS 9
Sickness in small Business – Concept, Magnitude, causes and consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.

TOTAL HOURS: 45

TEXT BOOKS:

1. S.S.Khanka “Entrepreneurial Development” S.Chand & Co. Ltd. Ram Nagar New Delhi, 1999.
2. Kuratko & Hodgetts, “Enterprenuership – Theory, process and practices”, Thomson learning 6th edition.

REFERENCES:

1. Hisrich R D and Peters M P, “Entrepreneurship” 5th Edition Tata McGraw-Hill, 2002.
2. Mathew J Manimala,” Enterprenuership theory at cross roads: paradigms and praxis” Dream tech 2nd edition 2006.
3. Rabindra N. Kanungo “Entrepreneurship and innovation”, Sage Publications, New Delhi, 1998.
1. EDII “ Faulty and External Experts – A Hand Book for New Entrepreneurs

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research
Level 2: Bounded Research
Level 3: Scaffolded Research
Level 4: Self actuated Research
Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech - Manufacturing Technology 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

PRIST Deemed to be University

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAMME HANDBOOK

M.Tech. – Manufacturing Technology

PART TIME PROGRAMME

Regulation 2017

(for candidates admitted to M.Tech Mechanical Engineering programme from June 2017 onwards)

COURSE STRUCTURE

Semester I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17248S11EP	Advanced Engineering Mathematics	3	1	0	4
17254H12P	Theory of Metal Cutting	3	1	0	4
17254H13P	Advanced Manufacturing Processes	3	1	0	4
17254L14P	CIM Lab	0	0	3	3
17254CRSP	Research Led Seminar	0	0	0	1
TOTAL NO. OF CREDITS					**16**

Semester II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254H21P	Production Management	3	1	0	4
17254H22P	MEMS and Nano Technology	4	0	0	4
17254E23—P (A to C)	Elective - I	4	0	0	4
17254L24P	Automation Lab	0	0	3	3
172TECWRP	Technical Writing/Seminar	0	0	3	3
17254CRMP	Research Methodology	4	0	0	3
17254CBRP	Participation in Bounded Research	0	0	0	2
TOTAL NO. OF CREDITS					**23**

Semester III

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254H31P	Mechanical Metallurgy	3	1	0	4
17254H32P	Automated Computer Integrated Manufacturing Systems	3	1	0	4
17254E33—P (A to C)	Elective II	4	0	0	4
17254CSRP	Design Project /SOCIO Technical Project (scaffolded Research)	0	0	0	4
TOTAL NO. OF CREDITS					**16**

Semester IV

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254H41P	Manufacturing Metrology and Quality Control	4	0	0	4
17254H42P	Metal Forming Process	4	0	0	4
17254E43—P (A to B)	Elective III	4	0	0	4
17254P44P	Project Work Phase I	0	0	6	6
TOTAL NO. OF CREDITS					**18**

Semester V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E51—P (A to B)	Elective IV	4	0	0	4
17254E52—P (A to B)	Elective V	4	0	0	4
17254E53—P (A to B)	Elective VI	4	0	0	4
TOTAL NO. OF CREDITS					**12**

Semester VI

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254P61P	Project Work Phase II	0	0	12	12
TOTAL NO. OF CREDITS					**12**

TOTAL NO. OF CREDITS (I to VI) = 97

List of Electives - Elective – I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E23AP	Finite Element Application in Manufacturing	4	0	0	4
17254E23BP	Lean Manufacturing	4	0	0	4
17254E23CP	Design and Analysis of Experiments	4	0	0	4

Elective – II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E33AP	Materials Management and Logistics	4	0	0	4
17254E33BP	Financial Management	4	0	0	4
17254E33CP	Manufacturing Information Systems	4	0	0	4

Elective – III

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E43AP	Advanced Metrology and Computer Aided Inspection	4	0	0	4
17254E43BP	Maintenance Management	4	0	0	4
17254E43CP	Optimization Techniques	3	1	0	4

Elective – IV

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E51AP	Manufacturing Systems and Simulation	4	0	0	4
17254E51BP	Instrumentation and Control Engineering	4	0	0	4
17254E51CP	Artificial Intelligence and Neural Networks	3	1	0	4

Elective – V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E52AP	Product Design and Development	4	0	0	4
17254E52BP	Fluid Power Automation	4	0	0	4

Elective – VI

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
17254E53AP	Advanced Material Technology	4	0	0	4
17254E53BP	Industrial Ergonomics	4	0	0	4

I - SEMESTER

17254H12P THEORY OF METAL CUTTING 3 1 0 4

OBJECTIVE:

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

UNIT- I: Orthogonal Cutting:

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

UNIT-II: Chip Formation:

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

UNIT-III : Tool Life and Machinability:

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

UNIT-IV: Thermal Analysis in Metal Cutting:

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

UNIT-V: Chatter:

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

BOOKS FOR REFERENCE:

1. Juneja .B.L, "Fundamentals of Metal cutting and Machine tools", New Age International,1995.

2. Bhattacharya.A, "Metal Cutting Theory and Practice", Central book publications
3. Kuppusamy .G, "Principle of Metal Cutting", University Press,1996.
4. Shaw .M.C, "Metal Cutting Principles",I BH Publications,1992.

Armarego E.J.A and Brown R.H, "The Machining of Metals", Prentice Hall,1969

SEMESTER II

17254H21P PRODUCTION MANAGEMENT 3 1 0 4

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

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

UNIT-II : Aggregate Planning :
Methods of aggregate planning- graphical and charting methods, trial and error, transportation method- concepts of linear decision rule.

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

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

UNIT-V: Scheduling:
Scheduling and assignment problems - notation and definitions - criteria, objective functions for scheduling - job shop scheduling: sequencing of n job s thorough 1 machine - priority rules, n jobs through 3, m machines - Johnsons rule, CDS algorithm, 2 jobs on m machine - graphical method- multi product assignment problem - index method, Hungarian method.

BOOKS FOR REFERENCE:

1. Production Operation Management:Theory And Problems, Chary:S.N, TMH, New delhi,1990.
2. Production Operation Management, Pannerselvam.R, PHI, 1999.
3. Operation Management Theory And Problems, Monks.J,G., McGraw HILL,1987.
4. Production operation management, chase.R.B,. Aquiliano.N.J and Jacobs.R.R.,8th Edition, TMH, 1988.
5. Production Planning And Inventory Control, Narashimhan. S.L., Mcleavy.D.W.,and Billington.P.J., 2nd Edition., PHI,1997

17254L24P AUTOMATION LAB 0 0 3 3

AIM:

To impart knowledge in the area of hydraulic and pneumatic components and its functions.

OBJECTIVE:

• To make the students to learn the basic concepts of hydraulics and pneumatics and its applications in the area of manufacturing process.
• To simulate the various hydraulics and pneumatics circuits.

EXPERIMENTS:

1. Simulation of single and double acting cylinder circuits
2. Simulation of Hydraulic circuits
3. Simulation of electro pneumatic circuits
4. Simulation of electro hydraulic circuits
5. Simulation of PLC circuits
6. Exercises on linear and angular measurements
7. Exercises on speed measurements
8. Exercises on Vibration measurements
9. Exercises on Motion controller using servo motors, encoders, etc.
10. Exercises on fiber optics transducers.
11. Exercises on stepper motor.
12. Exercises on microprocessor based data acquisition system.
13. Software simulation of fluid power circuits using Automation studio.

TOTAL : 30 PERIODS

SEMESTER III

17254H31P MECHANICAL METALLURGY 3 1 0 4

OBJECTIVE:

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

UNIT-I: Tensile Study:

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

UNIT-II: Hardness and Toughness:

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

UNIT-III: Fatigue:

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

UNIT-IV: Fracture Behaviour:

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

UNIT-V: Creep:

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

TEXT BOOKS:

1. George E. Dieter, "Mechanical Metallurgy", Mc Graw Hill, NewYork, 1988.
2. M.A. Meyers and K.Chawla, "Mechanical Metallurgy", PHI.

BOOKS FOR REFERENCE:

1. Metals Hand Book, "Mechanical Testing", Vol. 8, 9th Ed., ASM.
2. Thomas Countney.H., "Mechanical Behaviour of Materials", Mc Graw hill, 2nd Ed., 2000.
3. Hertzberg R.W., "Deformation and Fracture Mechanics of Engineering Materials", 2ne Ed., John Wiley & Sons. 1983.

SEMESTER IV

17254H41P MANUFACTURING METROLOGY AND QUALITY CONTROL 3 1 0 4

AIM:

To expose the students, the importance of measurement and the various latest measuring techniques using Laser, Coordinate measuring machines and Optoelectronics devices. Also to stress upon the Importance of quality in manufacturing.

OBJECTIVES:

To impart through knowledge in various latest measurement systems such as laser metrology, coordinate measuring machines and electro-optical devices. Also to make the students to understand quality

UNIT – I LASER METROLOGY 8

Introduction – types of lasers – laser in engineering metrology – metrological laser methods for applications in machine systems – Interferometry applications – speckle interferometry – laser interferometers in manufacturing and machine tool alignment testing – calibration systems for industrial robots laser Doppler technique – laser Doppler anemometry.

UNIT – II PRECISION INSTRUMENTS BASED ON LASER 9

Laser telemetric systems – detection of microscopic imperfections on high quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high inertia laser scan technique – rotating mirror technique – laser gauging – bar coding – laser dimensional measurement system.

UNIT – III CO-ORDINATE MEASURING MACHINE 10

Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors – displacement devices – Performance Evaluations – Software – Hardware – Dynamic errors – Thermal effects diagram – temperature variations environment control – applications.

UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 9

Opto electronic devices – CCD – On-line and in-process monitoring in production – applications image analysis and computer vision – Image analysis techniques – spatical feature – Image extraction – segmentation – digital image processing – Vision system for measurement – Comparison laser scanning with vision system.

UNIT – V QUALITY IN MANUFACTURING ENGINEERING 9

Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. John A. Bosch, Giddings and Lewis Dayton, Co-ordinate Measuring Machines and Systems, Marcel Dekker, Inc, 1999.
2. Juran J.M. and Gyna F.M., Quality Planning and Analysis, Tata-McGraw Hill, New Delhi
3. Zuech, Nello Understanding and Applying Machine Vision, Marcel Dekker, Inc, 2000
4. Elanchezhian.C, Vijaya Ramnath.B and Sunder Selwyn, T., Engineering Metrology, Eswar Press, Chennai, 2004.

17254H42P METAL FORMING PROCESS 4 0 0 4

OBJECTIVE: To study about the response of materials under plastic deformation and the various techniques for finding the stress for various metal working processes, and the recent developments in high speed forming.

UNIT-I: Stress and Strain:

Stress-State of stress in two dimensions – three dimensions – stress tensor-Mohr's circles – 2D and 3D state of stress – Description of strain at a point – Mohr's circle of strain- Hydrostatic and stress deviator component of stress- Plasticity- flow curve-true and true strain yield criteria for ductile loads combined stress test-plastic stress and strain relations- Levy Mises equations-Prandyl_Resus equations.

UNIT-II: Analysis of Metal Forming:

Work Load analysis – work formula for homogeneous deformation- rolling, rod drawing and extrusion processes -Determination of load by stress evaluation method-Determination of drawing load – strip drawing with wedge shaped dies and cylindrical rod drawing with a conical die.

UNIT-III: Stress Evaluation:

Stress evaluation method-Determination of forging load-plane strain forging of a thin strip and a flat circular disc- Determination of extrusion load for round band flat strip-upper bound analysis – plane strain indentation with frictionless interface

UNIT-IV: High velocity Forming:

Study of effect of high speed on stress strain relationships- High velocity forming equipment-Description of high speed forming machine – hot forging, pneumatic-mechanical, high velocity forging – Fuel combustion process- Electro magnetic forming –Introduction- Procedure - process variables- Applications

UNIT-V: Advanced Forming process:

Explosive Forming – Explosives – characteristics- stand off and contact operations-stress waves and their effects- process variables – properties of formed components-applications- Electro hydraulic forming – principles, requirements and characteristics – process variables- water hammer forming- principles and parameters- governing the process.

BOOKS FOR REFERENCE:

1. George E.Dieter, "Mechanical Metallurgy", Mc Graw Hill International Edition, New York,1988
2. Rowe G.W,Edward , "An Introduction to the Principles of Metal Working", Edward Arnold publications.
3. Davies.R and Austin.E.R, "Developments in High Metal Forming", The Machinery Publishing Co.Ltd
4. Robert H.Wagoner and Jean Loup Chenot, "Fundamentals of Metal Forming", John Wiley and Sons Inc, New York,1992

17254E23BP LEAN MANUFACTURING 4 0 0 4

AIM:

To introduce the concepts of lean manufacturing system.

OBJECTIVES:

• To study the various tools for lean manufacturing (LM).
• To apply the above tools to implement LM system in an organization.

UNIT – I INTRODUCTION TO LEAN MANUFACTURING 7

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

UNIT – II CELLULAR MANUFACTURING, JIT, TPM 9

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT – III SET UP TIME REDUCTION, TQM, 5S, VSM 10

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT – IV SIX SIGMA 9

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

UNIT – V CASE STUDIES 10

Various case studies of implementation of lean manufacturing at industries.

TOTAL: 45 PERIODS
BOOKS FOR REFERENCES:

1. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003
2. Rother M. and Shook J, 1999 'Learning to See: Value Stream Mapping to Add Value and Eliminate Muda' , Lean Enterprise Institute, Brookline, MA.
1. Mikell P. Groover (2002) 'Automation, Production Systems and CIM.

17254E23CP - DESIGN AND ANALYSIS OF EXPERIMENTS 3 1 0 4

1. INTRODUCTION 7

Defining Research, Scientific Enquiry, Hypothesis, Scientific Method, Types of Research, Research Process and steps in it. Research Proposals – Types, contents, sponsoring agent's requirements, Ethical, Training, Cooperation and Legal aspects.

2. RESEARCH DESIGN 10

Meaning, Need, Concepts related to it, categories; Literature Survey and Review, Dimensions and issues of Research Design, Research Design Process – Selection of type of research, Measurement and measurement techniques ,Selection of Sample, Selection of Data Collection Procedures, Selection of Methods of Analysis, Errors in Research. Research Problem Solving – Types, Process and Approaches – Logical, Soft System and Creative; Creative problem solving process, Development of Creativity, Group Problem Solving Techniques for Idea Generation – Brain storming and Delphi Method.

3. RESEARCH MODELING 10

Mathematical – Classification of Models, Development of Models, Stages in Model building, Principles of Modeling, Use of Analogy, Models as Approximations, Data consideration and Testing of Models (b) Heuristics and Simulation – Definition, Applications and reasons for using Heuristics, Heuristic Methods and approaches, Meta-Heuristics; Simulation – Meaning, Applications and Classification of Simulation Models, Process of Simulation, Steps and Features of Simulation Experiments and their Validation.

4. EXPERIMENTATION 8

Objective, Strategies, Factorial Experimental Design, Applications of Experimental Design, Basic Principles – Replication, Randomization and Blocking, Guidelines for designing experiments; Laboratory Experiments, Methods of manipulating Variables, Errors in Experiments, Steps in Design of Experiments.

5. PROCESS OPTIMIZATION AND ANALYSIS 10

Factorial Design principles, Two factor Factorial Design, General Factorial Design, Fitting response Curves and Surfaces, Blocking, Taguchi Approach to Parameter Design, Robust Design. Analysis of Variance and Co-variance, Hypothesis Testing – Parametric. Report Writing: Pre-writing Considerations, Principles of Thesis Writing, Format of Report Writing, Format of Publication in Research Journals

REFERENCES FOR BOOKS:

1. Krishnaswamy, K.N., Sivakumar, Appa Iyer & Mathirajan M., (2006) -Management Research Methodology: Integration of Principles, Methods & Techniques (New Delhi, Pearson Education)
2. Montgomery, Douglas C. (2004) – Design & Analysis of Experiments, 5/e. (New York, John Wiley & Sons)
3. Kothari, C.K. (2004) – Research Methodology, Methods & Techniques, 2/e. (New Delhi, New Age International Ltd. Publishers)
4. Ross, Phillip J. (1996) – Taguchi Techniques for Quality Engineering, 2/e. (New York, McGraw Hill)
5. Rao S. S. (2004) – Engineering Optimization Theory & Practices, 3/e (New Delhi, New Age International Ltd., Publishers)

List of Electives - Elective II

17254E33AP MATERIALS MANAGEMENT AND LOGISTICS 4 0 0 4

AIM:

To introduce to the students the various functions of materials management and logistics

OBJECTIVE:

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

UNIT I INTRODUCTION 6

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II MANAGEMENT OF PURCHASE 7

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

UNIT III MANAGEMENT OF STORES AND LOGISTICS 12

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

UNIT IV MATERIALS PLANNING 10

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

UNIT V INVENTORY MANAGEMENT 10

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45

BOOKS FOR REFERENCE:

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. Guptha P.K. and Manmohan, Problems in Operations Research, Suttan Chand & Sons, 2003.
4. Dr.R. Kesavan, C.Elanchezian and B.Vijaya Ramnath, Production Planning and Control, Anuratha Publications, Chennai, 2008.
5. G. Reghuram, N. Rangaraj, Logistics and supply chain management – cases and concepts, Macmillan India Ltd., 2006.

17254E33BP FINANCIAL MANAGEMENT 4 0 0 4

AIM:

To introduce the concepts of financial and various functions of financial management so that the students will be able to handle higher level financial decisions.

OBJECTIVES:

To train students in various functions of finance such as working capital management, current assets management so that students will be able to make high investment decisions when they take up senior managerial positions.

UNIT – I FINANCIAL ACCOUNTING 8

Accounting principles - Basic records - Preparation and interpretation of profit and loss statement - balance sheet - Fixed assets - Current assets.

UNIT – II COST ACCOUNTING 12

Elements of cost - cost classification - material cost - labour costs - overheads - cost of a product - costing systems - cost determination - process - costing - Allocation of overheads - Depreciation - methods.

UNIT – III MANAGEMENT OF WORKING CAPITAL 10

Current assets - Estimation of working capital requirements - Management of accounts receivable - Inventory - Cash - Inventory valuation methods.

UNIT – IV CAPITAL BUDGETING 8

Significance of capital budgeting - payback period - present value method – accounting rate of return method - Internal rate of return method.

UNIT – V PROFIT PLANNING AND ANALYSIS 7

Cost - Volume profit relationship relevant costs in decision making profit management analysis - Break even analysis.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Presanna Chandra, Financial Management, Tata McGraw Hill, 1998.
2. G.B.S. Narang, Production and Costing, Khanna Publishers, 1993.
3. R. Kesavan, C.Elanchezian, Sundar Selwyn, Engineering Economics and Financial Accounting, Laxmi Publications, New Delhi, 2005.
4. R Kesavan, C. Elanchezian, B.Vijaramnath, Engineering Economics and Cost Analysis Anuratha Publications, Chennai.

17254E33CP MANUFACTURING INFORMATION SYSTEMS 4 0 0 4

AIM:

To impart the knowledge in manufacturing information system.

OBJECTIVE:

On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

UNIT I INTRODUCTION 5

The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

UNIT II DATABASE 7

Terminologies – Entities and attributes – Data models, schema and subschema - Data Independence – ER Diagram – Trends in database.

UNIT III DESIGNING DATABASE 13

Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query.

UNIT IV MANUFACTURING CONSIDERATION 10

The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the stock status database – the complete IOM database.

UNIT V INFORMATION SYSTEM FOR MANUFACTURING 10

Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems; Computer based production management system, computerized manufacturing information system – case study.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Luca G.Sartori, “Manufacturing Information Systems”, Addison-Wesley Publishing Company, 1988.
2. Date.C.J.,”An Introduction to Database Systems” Addison Wesley, 8th Edn,.2003
3. Orlicky.G., “Material Requirements Planning”, McGraw-Hill, 1994.
4. Kerr.R, “Knowledge based Manufacturing Management”, Addison-Wesley,1991.
5. Manufacturing Information & Data Systems Analysis, Design & Practice,CECELJA FRANJO, 2002.

List of Electives - Elective III

17254E43AP ADVANCED METROLOGY AND COMPUTER AIDED INSPECTION 4 0 0 4

AIM:

To give a thorough knowledge of measurement and instrumentation of increasing importance in industry. The student will be knowledgeable in various standards and proliferation of computerized and automated inspecting techniques along with the classical metrology.

OBJECTIVES:

- To teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries.
- Expose the students to various modern metrological instruments and the procedure used to operate these instruments.

UNIT I GENERAL CONCEPTS OF MEASUREMENT 8

Definition – Standards of measurement – Errors in measurement – Interchangeability and Selective assembly – Accuracy and Precision – Calibration of instruments.

UNITII MEASUREMENT OF SURFACE FINISH AND MEASURING MACHINES 9

Definitions – Types of Surface Texture: Surface Roughness Measurement Methods- Comparison, Profilometer, 3D Surface Roughness Measurement – Instruments.

UNIT III INTERFEROMETRY 8

Interferometry – Introduction, Principles of light interference – Interferometers – Measurement and Calibration – Laser Interferometry.

UNIT IV COMPUTER AIDED AND LASER METROLOGY 10

Tool Makers Microscope – Microhite – Co – Ordinate measuring machine – Applications – Laser Micrometer, Laser Scanning gauge, Non contact and in-process inspection, Vision system.

UNIT V IMAGE PROCESSING 10

Overview, Computer imaging systems, Image Analysis, Preprocessing, Human vision system, Image model, Image enhancement, gray scale models, histogram models, Image Transforms.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. GUPTA, I.C, “A Text Book of engineering metrology”, Dhanpat Rai and Sons, 1996.
2. G.N.GALYER F.W. and C.R.SHOTBOLT, “Metrology for engineers”, ELBS, 1990.
3. GRAHAM T.SMITH, “Industrial Metrology”, Springer, 2002
4. “ASTE Handbook of Industries Metrology”, Prentice Hall of India Ltd., 1992.
5. R.K.RAJPUT, “Engineering Metrology and Instrumentations”, Kataria & Sons Publishers, 2001.
6. MILAN SONKA, VACLAV HLAVAC and ROGER BOYLE, “Image Processing, Analysis, and Machine Vision”, Cengage-Engineering; 3 edition (March 19, 2007).

17254E43BP MAINTENANCE MANAGEMENT 4 0 0 4

OBJECTIVE:

To understand the concepts of maintenance management and to have knowledge in developing a suitable maintenance system for any type of an organization.

UNIT I: Introduction to Maintenance Management: 7

Maintenance: Its role and scope in total Organizational contexts - role of Maintenance. Centralized and decentralized maintenance organization structures. Maintenance Economics – reliability and Availability – MTBF, MTTR.

UNIT II: Maintenance Categories: 10

Maintenance system– Categories - Design and its selection – Breakdown Maintenance –Routine Maintenance- Predictive Maintenance –Preventive Maintenance- Corrective Maintenance-Total Productive Maintenance –Maintenance Schedule – Repair Cycle.

UNIT III: Spare Parts Management: 8

Pareto's principles for repetitive breakdown analysis, spares management, planning considerations for each type of activities.

UNIT – IV: Condition Monitoring: 10

Condition Monitoring (CM) – Introduction- Economics of CM – On-load and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

UNIT V: Maintenance Manpower Cost, Performance Management: 10

Maintenance man power planning - Selection training - Scheduling maintenance costs - Budget preparation and budgetary control of maintenance expenditures Maintenance effectiveness various performance indices - evaluation, uses and limitations - Monitoring of Maintenance performance.

BOOKS FOR REFERENCE:

1. Gopalakrishnan P. and Sundarajan 1996. Maintenance Management. New Delhi, Prentice-Hall of India.
2. Srivastava S.K., "Industrial Maintenance Management", - S. Chand & Co.,1981.
3. Higgirs L.T and Morrow L.C., 1997, ``Maintenance Engineering Handbook``, McGraw Hill.
Armstrong, "Condition Monitoring", BSIRSA, 1988.

17254E43CP OPTIMIZATION TECHNIQUES 3 1 0 4

UNIT I - INTRODUCTION TO OPTIMIZATION 7

Formulation of an optimization problem- Classification of optimization problem – optimization techniques- Classical optimization technique – Single variable optimization – Multi variable optimization algorithms

UNIT II - MINIMIZATION METHODS 8

One dimensional minimization methods: unimodal function – elimination methods: unrestricted search, exhaustive search, Dichotomous search, Fibonacci methods, Golden section methods, Interpolation methods: Quadratic and cubic interpolation methods.

UNIT III - CONSTRAINED OPTIMIZATION TECHNIQUES 10

Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions, Lagrange multipliers - separable programming and Geometric programming.

UNIT IV - UNCONSTRAINED OPTIMIZATION TECHNIQUES 10

Multi variable unconstrained optimization techniques: Direct search methods: Random search method, unvaried method, pattern search method, steepest descent method and Conjugate gradient method.

UNIT V - APPLICATIONS OF HEURISTICS IN OPTIMIZATION 10

Heuristics-Introduction-Multi objective optimization: Genetic algorithms and Simulated Annealing techniques; neural network & Fuzzy logic principles in optimization.

BOOKS FOR REFERENCE:

1. Rao, Singaresu, S., "Engineering Optimization – Theory & Practice", New Age International (P) Limited, New Delhi, 2000.
2. Johnson Ray, C., "Optimum design of mechanical elements", Wiley, John & Sons, 1990.
3. Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples", Prentice Hall of India Pvt. 1995.
4. Goldberg, D.E., "Genetic algorithms in search, optimization and machine", Barnen, Addison-Wesley, New York, 1989.

List of Electives - Elective IV

17254E51AP MANUFACTURING SYSTEMS AND SIMULATION 4 0 0 4

AIM:
To introduce the various concepts of manufacturing system simulation.

OBJECTIVES:
- To model manufacturing systems of different kinds.
- To make use of simulation languages for manufacturing systems.

UNIT I INTRODUCTION 8
Basic concepts of system – elements of manufacturing system - concept of simulation – simulation as a decision making tool – types of simulation – Monte-Carlo simulation - system modeling – types of modeling – Limitations and Areas of application of simulation.

UNIT II RANDOM NUMBERS 10
Probability and statistical concepts of simulation – Pseudo random numbers – methods of generating random numbers – discrete and continuous distribution – testing of random numbers – kolmogorov-mirnov test, the Chi-Square test - sampling - simple, random and simulated.

UNIT III DESIGN OF SIMULATION EXPERIMENTS 10
Problem formulation – data collection and reduction – time flow mechanical – key variables - logic flow chart starting condition – run size – experimental design consideration – output analysis, interpretation and validation – application of simulation in engineering industry.

UNIT IV SIMULATION LANGUAGE 9
Comparison and selection of simulation languages - Study of GPSS (Basic blocks only) Generate, Queue, Depart, Size, Release, Advance, Terminate, Transfer, Enter and Leave.

UNIT V CASE STUDIES 10
Development of simulation models using GPSS for queuing, production, inventory, maintenance and replacement systems – case studies.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Jerry Banks and John S.Carson, “Discrete event system simulation”, Prentice Hall 1991
2. 1 .John H.Mize and J.Grady Cox, “Essentials of simulation” – Prentice hall 1989.
3. Geoffrey Gordon “System simulation” – Prentice Hall of India, 1992
4. Jeffrey L.Written, Lonnie D, Bentley and V.M. Barice, “System analysis and Design Methods”, Galgotia publication, 1995
5. Averill M.Law and W.David Kelton, “Simulation Modeling and analysis”, McGraw Hill International Editions, 1991
6. Shannon R.E., “System simulation”, Prentice Hall 1993.

17254E51CP ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS 3 1 0 4

UNIT – I - Neural Networks 8

Introduction to soft Computing-Neural Networks-Supervised Learning Neural Networks – Perceptrons – Adaline – Back propagation Multilayer perceptrons – Radial Basic Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Habbian Learning.

UNIT – II - Fuzzy Logic: 10

Fuzzy Sets – Basic Definition and Terminology – Set –theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning. Fuzzy Logic: Extension principle and Fuzzy Relations – Fuzzy If – Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

UNIT – III Genetic Algorithm: 9

Derivative – based Optimization – Descent Methods – The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative – free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

UNIT – IV Neuro Fuzzy Modeling: 10

Adaptive Neuro – Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – learning Methods that Cross – Fertilize ANFIS and RBFN – Coactive Neuro – Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

UNIT – V Applications: 8

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction – Single MLP approaches –CANFIS modeling for color recipe prediction

BOOKS FOR REFERENCE:

1. Jang, J.S.R., C.T. Sun and E. Mizutani., "Neuro – Fuzzy and Soft Computing", PHI, Person Education, 2004.

2. Eberhart, R., simpson, P. and Dobbins, R., " Computatuonal Intelligence PC Tools", AP Professional, Boston 1996.

3. Goldberg, Davis E., "Optimization and Machine Learning" Addison Wesley, New York, 1989.

4. S. Rajasekaran and Pai, G.A.V., "Neural Networks, Fuzzy Logic and Genetic Algorithms",Prentice Hall of India, New Delhi, 2003.

List of Electives - Elective V

17254E52AP PRODUCT DESIGN AND DEVELOPMENT 4 0 0 4

UNIT I - INTRODUCTION 7

Significance of product design, product design and development process, sequential engineering design method, the challenges of product development.

UNIT II - PRODUCT PLANNING AND PROJECT SELECTION 8

Identifying opportunities evaluate and prioritize projects, allocation of resources Identifying Customer Needs, Interpret raw data in terms of customers need, organize needs in hierarchy and establish the relative importance of needs.

UNIT III - PRODUCT SPECIFICATIONS 8

Establish target specifications, setting final specifications, Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally.

UNIT IV - INDUSTRIAL DESIGN AND CONCEPT SELECTION10

Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, Overview, concept screening and concept scoring, methods of selection.

UNIT V - THEORY OF INVENTIVE PROBLEM SOLVING (TRIZ) AND CONCEPT TESTING 12

Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model-based technology for generating innovative ideas Elements of testing: qualitative and quantitative methods including survey, measurement of customers' response, Intellectual Property: Elements and outline, patenting procedures.

BOOKS FOR REFERENCE:

1. Ulrich K. T, and Eppinger S.D, Product Design and Development, Tata McGraw Hill
2. Otto K, and Wood K, Product Design, Pearson
3. Engineering of creativity: introduction to TRIZ methodology of inventive Problem Solving, By Semyon D. Savransky, CRC Press.
4. Inventive thinking through TRIZ: a practical guide, By Michael A. Orloff, Springer.
5. Systematic innovation: an introduction to TRIZ ; (theory of inventive Problem Solving), By John Terninko, Alla Zusman, CRC Press.

17254E52BP FLUID POWER AUTOMATION 4 0 0 4

AIM:

To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

OBJECTIVE:

- To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.
- To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

UNIT I INTRODUCTION 5

Need for Automation, Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.

UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS 8

Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators – standard circuit symbols, circuit (flow) analysis.

UNIT III CONTROL AND REGULATION ELEMENTS 8

Direction flow and pressure control valves-Methods of actuation, types, sizing of ports pressure and temperature compensation, overlapped and under lapped spool valves operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

UNIT IV CIRCUIT DESIGN 10

Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.

UNIT V ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS 7

Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Antony Esposito, Fluid Power Systems and control Prentice-Hall, 1988.
2. Peter Rohner, Fluid Power logic circuit design. The Macmillan Press Ltd.,London, 1979
3. E.C.Fitch and J.B.Suryaatmadyn. Introduction to fluid logic, McGraw Hill, 1978.
4. W.Bolton, Mechatronics, Electronic control systems in Mechanical and Electrical Engineering Pearson Education, 2003.
5. Peter Rohner, Fluid Power Logic Circuit Design, Mcmelan Prem, 1994.

List of Electives - Elective VI

17254E53AP ADVANCED MATERIAL TECHNOLOGY 4 0 0 4

AIM:

To impart knowledge on advance concepts of material technology

OBJECTIVE:

- To enlight the PG students on elastic, plastic and fractured behaviour of engineering Materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

UNIT I ELASTIC AND PLASTIC BEHAVIOR 10

Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

UNIT II FRACTURE BEHAVIOUR 10

Griffith's theory, stress intensity factor and fracture toughness – Toughening mechanisms – Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law. Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

UNIT III SELECTION OF MATERIALS 10

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

UNIT IV MODERN METALLIC MATERIALS 8

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nano crystalline materials.

UNIT V NON METALLIC MATERIALS 7

Polymeric materials – Formation of polymer structure – Production techniques of fibers, foams, adhesives and coating – structure, properties and applications of engineering polymers – Advanced structural ceramics, WC, TIC, TaC, Al_2O_3, SiC, Si_3N_4 CBN and diamond – properties, processing and applications.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
2. Thomas H. Courtney, Mechanical Behaviour of Materials, (2nd edition), McGraw Hill, 2000.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4th Edition) Jaico, 1999.
4. ASM Hand book, Vol.11, Failure Analysis and Prevention, (10th Edition), ASM, 2002.
5. Ashby M.F., Material Selection in Mechanical Design, 3rd Edition, Butter Worth 2005.

17254E53BP INDUSTRIAL ERGONOMICS 4 0 0 4

UNIT – I INTRODUCTION 7

Concepts of human factors engineering and ergonomics – Man – machine system and design philosophy – Physical work – Heat stress – manual lifting – work posture – repetitive motion.

UNIT – II ANTHROPOMETRY 9

Physical dimensions of the human body as a working machine – Motion size relationships – Static and dynamic anthropometry – Anthropometric aids – Design principles – Using anthropometric measures for industrial design – Procedure for anthropometric design.

UNIT – III DESIGN OF SYSTEMS 9

Displays – Controls – Workplace – Seating – Work process – Duration and rest periods – Hand tool design – Design of visual displays – Design for shift work.

UNIT – IV ENVIRONMENTAL FACTORS IN DESIGN 11

Temperature – Humidity – Noise – Illumination –Vibration – Measurement of illumination and contrast – use of photometers – Recommended illumination levels. The ageing eye – Use of indirect (reflected) lighting – cost efficiency of illumination – special purpose lighting for inspection and quality control – Measurement of sound – Noise exposure and hearing loss – Hearing protectors – analysis and reduction of noise – Effects of Noise on performance – annoyance of noise and interference with communication – sources of vibration discomfort.

UNIT – V WORK PHYSIOLOGY 9

Provision of energy for muscular work – Role of oxygen physical exertion – Measurement of energy expenditure Respiration – Pulse rate and blood pressure during physical work – Physical work capacity and its evaluation.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Martin Helander, A guide to the ergonomics of manufacturing, East West press, 1996
2. E.J. McCormic, Human factors in engineering design, McGraw Hill 1976
3. R.S. Bridger Introduction to Ergonomics, McGraw Hill, 1995.

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-2017)

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Human Values	Professional Ethics	Environment and Sustainability
B.Tech - 17UGMECHPT	17148H11P	Transforms & Partial Differential Equations	-	-	-	-	-
B.Tech - 17UGMECHPT	17153H12P	Electrical drives and controls	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H13P	Engineering Thermodynamics	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H14P	Fluid Mechanics and Machinery	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H15P	Foundry And Welding Technology	-	-	-	-	-
B.Tech - 17UGMECHPT	17148H21P	Numerical Methods	-	-	-	-	-
B.Tech - 17UGMECHPT	17153H22P	Electronics and Microprocessors	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H23P	Thermal Engineering	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H24P	Strength of Materials	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H25P	Engineering Materials and Metallurgy	-	-	-	-	-
B.Tech - 17UGMECHPT	17148H31CP	Probability and Statistics	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H32P	Kinematics of Machinery	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H33P	Machine Tool Technology	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H34P	Engineering Metrology and Measurements	-	-	-	-	-
B.Tech - 17UGMECHPT	17154L35P	Computer Aided Simulation and Analysis Laboratory	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H41P	Power Plant Engineering	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H42P	Dynamics of Machinery	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H43P	Design of Machine Elements	-	-	-	-	-
B.Tech - 17UGMECHPT	17154E44DP	Renewable Sources of Energy	-	-	-	-	-
B.Tech - 17UGMECHPT	17154L45P	Dynamics Laboratory	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H51P	Heat and Mass Transfer	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H52P	Design of Transmission Systems	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H53P	Automobile Engineering	-	-	-	-	-

B.Tech - 17UGMECHPT	17154E54CP	Robotics	-	-	-	-	-
B.Tech - 17UGMECHPT	17154L55P	Heat Transfer Laboratory	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H61P	Finite Elements Analysis	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H62P	Mechatronics	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H63P	Computer Integrated Manufacturing	-	-	-	-	-
B.Tech - 17UGMECHPT	17160E64AP	Principles of Management	✓				
B.Tech - 17UGMECHPT	17154L65P	Mechatronics Laboratory	-	-	-	-	-
B.Tech - 17UGMECHPT	17160H71P	Total Quality Management	✓				
B.Tech - 17UGMECHPT	17154H72P	Process Planning and Cost Estimation	-	-	-	-	-
B.Tech - 17UGMECHPT	17154H73P	Applied Hydraulics and Pneumatics	-	-	-	-	-
B.Tech - 17UGMECHPT	17154E74CP	Unconventional Machining Process	-	-	-	-	-
B.Tech - 17UGMECHPT	17154P75P	Project Work	-	-	-	-	-
M.Tech - 17PGMFTPT	17248S11EP	Advanced Engineering Mathematics	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H12P	Theory of Metal Cutting	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H13P	Advanced Manufacturing Processes	-	-	-	-	-
M.Tech - 17PGMFTPT	17254L14P	CIM Lab	-	-	-	-	-
M.Tech - 17PGMFTPT	17254CRSP	Research Led Seminar	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H21P	Production Management	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H22P	MEMS and Nano Technology	-	-	-	-	-
M.Tech - 17PGMFTPT	17254E23BP	Lean Manufacturing	-	-	-	-	-
M.Tech - 17PGMFTPT	17254L24P	Automation Lab	-	-	-	-	-
M.Tech - 17PGMFTPT	172TECWRP	Technical Writing/Seminar	-	-	-	-	-
M.Tech - 17PGMFTPT	17254CRMP	Research Methodology	-	-	-	-	-
M.Tech - 17PGMFTPT	17254CBRP	Participation in Bounded Research	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H31P	Mechanical Metallurgy	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H32P	Automated Computer Integrated Manufacturing Systems	-	-	-	-	-
M.Tech - 17PGMFTPT	17254E33CP	Manufacturing Information Systems	-	-	-	-	-
M.Tech - 17PGMFTPT	17254CSRP	Design Project /SOCIO Technical Project (scaffolded Research)	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H41P	Manufacturing Metrology and Quality Control	-	-	-	-	-
M.Tech - 17PGMFTPT	17254H42P	Metal Forming Process	-	-	-	-	-
M.Tech - 17PGMFTPT	17254E43BP	Maintenance Management	-	-	-	-	-
M.Tech - 17PGMFTPT	17254P44P	Project Work Phase I	-	-	-	-	-
M.Tech - 17PGMFTPT	17254E51BP	Instrumentation and Control Engineering	-	-	-	-	-

M.Tech - 17PGMFTPT	17254E52BP	Fluid Power Automation	-	-	-	-	-
M.Tech - 17PGMFTPT	17254E53AP	Advanced Material Technology	-	-	-	-	-
M.Tech - 17PGMFTPT	17254P61P	Project Work Phase II	-	-	-	-	-

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Mapping of Courses to Cross cutting Issues

Department of Electrical and Electronics Engineering (R-2017)

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 -17UGEEEPT	17148S11P	Transforms and Partial Differential Equations					✓			
B.Tech -17UGEEEPT	17153H13P	Circuit Analysis and Networks								
B.Tech -17UGEEEPT	17153H14P	Electronic circuits								
B.Tech -17UGEEEPT	17153H15P	Electrical Machines-I								
B.Tech -17UGEEEPT	17148S21P	Numerical Methods					✓			
B.Tech -17UGEEEPT	17150S22P	Computer Architecture								
B.Tech -17UGEEEPT	17153H23P	Electrical Machines-II								
B.Tech -17UGEEEPT	17153H24P	Digital Electronics								

B.Tech -17UGEEEPT	17153H25P	Transmission and Distribution								
B.Tech -17UGEEEPT	17148S31P	Probability and Statistics					✓			
B.Tech -17UGEEEPT	17152S32P	Analog Integrated Circuits								
B.Tech -17UGEEEPT	17153H33P	Power Electronics								
B.Tech -17UGEEEPT	17153H34P	Measurements and Instrumentation								
B.Tech -17UGEEEPT	17153L35P	Machines Lab								
B.Tech -17UGEEEPT	17153H41P	Protection and switch gear								
B.Tech -17UGEEEPT	17153H42P	High Voltage DC Transmission								
B.Tech -17UGEEEPT	17153H43P	Solid State Drives								
B.Tech -17UGEEEPT	17153E44CP	BioMedical Instrumentation				✓				
B.Tech -17UGEEEPT	17153L45P	Control System & Measurements Lab								
B.Tech -17UGEEEPT	17153H51P	Power System Analysis								
B.Tech -17UGEEEPT	17153H52P	Power Quality								
B.Tech -17UGEEEPT	17153H53P	Special Electrical Machines								
B.Tech -17UGEEEPT	17158E54AP	Environmental Science and Engineering						✓		
B.Tech -17UGEEEPT	17153L55P	Power Electronics & Drives Lab								
B.Tech -17UGEEEPT	17153H61P	Utilization of Electrical Energy								
B.Tech -17UGEEEPT	17153H62P	Solid State Relays								
B.Tech -17UGEEEPT	17153H63P	Power System Operation and Control								
B.Tech -17UGEEEPT	17160E64AP	Principles of Management					✓			
B.Tech -17UGEEEPT	17153L65P	Power Systems Lab								
B.Tech -17UGEEEPT	17160S71P	Total Quality Management					✓			
B.Tech -17UGEEEPT	17153H72P	Electrical Machine Design								
B.Tech -17UGEEEPT	17153H73P	Power Plant Engineering								
B.Tech -17UGEEEPT	17153E74DP	Advanced Control systems					✓			
B.Tech -17UGEEEPT	17153P75P	Project Work								

B.Tech -17UGEEEFT	**17147S11**	Communicative English					✓			
B.Tech -17UGEEEFT	**17148S12**	Engineering Mathematics - I								
B.Tech -17UGEEEFT	**17149S13**	Engineering Physics								
B.Tech -17UGEEEFT	**17149S14**	Engineering Chemistry								
B.Tech -17UGEEEFT	**17154S15**	Engineering Graphics								
B.Tech -17UGEEEFT	**17150S16**	Problem Solving and Python programming								
B.Tech -17UGEEEFT	**17150L17**	Problem Solving and Python Programming Laboratory								
B.Tech -17UGEEEFT	**17147S21**	Technical English					✓			
B.Tech -17UGEEEFT	**17148S22A**	Engineering Mathematics - II								
B.Tech -17UGEEEFT	**17149S23B**	Physics for Electronics Engineering								
B.Tech -17UGEEEFT	**17149S24A**	Environmental Science and Engineering						✓		
B.Tech -17UGEEEFT	**17153S25C**	Circuit Theory								
B.Tech -17UGEEEFT	**17154S26C**	Basic Civil and Mechanical Engineering								
B.Tech -17UGEEEFT	**17154L27**	Engineering Practices Laboratory								
B.Tech -17UGEEEFT	**17153L28C**	Electric Circuits Laboratory								
B.Tech -17UGEEEFT	**171ICA29**	Fundamentals of Indian Constitution and Economy								
B.Tech -17UGEEEFT	**17149S31C**	Transforms and Partial Differential Equations					✓			
B.Tech -17UGEEEFT	**17153C32**	Digital Logic Circuits								
B.Tech -17UGEEEFT	**17153C33**	Electromagnetic Theory								
B.Tech -17UGEEEFT	**17153C34**	Electrical Machines - I								
B.Tech -17UGEEEFT	**17153C35**	Electron Devices and Circuits								
B.Tech -17UGEEEFT	**17153C36**	Power Plant Engineering								
B.Tech -17UGEEEFT	**17153L37**	Electronics Laboratory								

B.Tech -17UGEEEFT	**17153L38**	Electrical Machines Laboratory - I								
B.Tech -17UGEEEFT	**17149C41C**	Numerical Methods					✓			
B.Tech -17UGEEEFT	**17153C42**	Electrical Machines - II								
B.Tech -17UGEEEFT	**17153C43**	Transmission and Distribution								
B.Tech -17UGEEEFT	**17153C44**	Measurements and Instrumentation								
B.Tech -17UGEEEFT	**17153C45**	Linear Integrated Circuits and Applications								
B.Tech -17UGEEEFT	**17153C46**	Control Systems								
B.Tech -17UGEEEFT	**17153L47**	Electrical Machines Laboratory - II								
B.Tech -17UGEEEFT	**17153L48**	Linear and Digital Integrated Circuits Laboratory								
B.Tech -17UGEEEFT	**17153L49**	Technical Seminar					✓			
B.Tech -17UGEEEFT	**17153CRS**	Research Led Seminar					✓			
B.Tech -17UGEEEFT	**17153C51**	Power System Analysis								
B.Tech -17UGEEEFT	**17153C52**	Microprocessors and Microcontrollers								
B.Tech -17UGEEEFT	**17153C53**	Power Electronics								
B.Tech -17UGEEEFT	**17154FE54A**	Renewable Energy Sources						✓		
B.Tech -17UGEEEFT	**17153C55**	Digital Signal Processing								
B.Tech -17UGEEEFT	**17153C56**	Object Oriented Programming								
B.Tech -17UGEEEFT	**17153L57**	Control and Instrumentation Laboratory								
B.Tech -17UGEEEFT	**17153L58**	Object Oriented Programming Laboratory								
B.Tech -17UGEEEFT	**17153L59**	Professional Communication					✓			
B.Tech -17UGEEEFT	**17153CRM**	Research Methodology								
B.Tech -17UGEEEFT	**17153C61**	Solid State Drives								
B.Tech -17UGEEEFT	**17153C62**	Protection and Switchgear								
B.Tech -17UGEEEFT	**17153C63**	Embedded Systems								

B.Tech -17UGEEEFT	**17153E64C**	Design of Electrical Apparatus								
B.Tech -17UGEEEFT	**17155FE74B**	Waste water Treatment						✓		
B.Tech -17UGEEEFT	**17153L66**	Power Electronics and Drives Laboratory								
B.Tech -17UGEEEFT	**17153L67**	Microprocessors and Microcontrollers Laboratory								
B.Tech -17UGEEEFT	**17153MP68**	Mini Project								
B.Tech -17UGEEEFT	**17153CBR**	Participation in Bounded Research								
B.Tech -17UGEEEFT	**17153C71**	High Voltage Engineering								
B.Tech -17UGEEEFT	**17153C72**	Power System Operation and Control								
B.Tech -17UGEEEFT	**17153C73**	Renewable Energy Systems						✓		
B.Tech -17UGEEEFT	**17153E65B**	Special Electrical Machines								
B.Tech -17UGEEEFT	**17153E75B**	Human Rights				✓				
B.Tech -17UGEEEFT	**17153E76F**	Total Quality Management					✓			
B.Tech -17UGEEEFT	**17153L77**	Power System Simulation Laboratory								
B.Tech -17UGEEEFT	**17153L78**	Renewable Energy Systems Laboratory								
B.Tech -17UGEEEFT	**17153CSR**	Participation in Scaffolded Research (Design / Socio Technical Project)								
B.Tech -17UGEEEFT	**17153E81F**	Professional Ethics in Engineering					✓			
B.Tech -17UGEEEFT	**17153E82G**	Fundamentals of Nano Science								
B.Tech -17UGEEEFT	**17153P81**	Project Work								
M.Tech -17PGEEEFT	17248S11D	Applied Mathematics For Electrical &Electronics Engineering					✓			
M.Tech -17PGEEEFT	17272H12	System Theory								
M.Tech -17PGEEEFT	17272H13	Power System Modeling and Analysis								
M.Tech -17PGEEEFT	17272H14	Economic Operations of Power Systems-I				✓				

M.Tech -17PGEEEFT	17272H15	High Voltage Direct Current Transmission System								
M.Tech -17PGEEEFT	17272E16A	Analysis of Inverters								
M.Tech -17PGEEEFT	17272L17	Power System Simulation Lab-I								
M.Tech -17PGEEEFT	17272CRS	Research Led Seminar					✓			
M.Tech -17PGEEEFT	17272H21	EHV power transmission								
M.Tech -17PGEEEFT	17272H22	Economic Operations of Power Systems-II				✓				
M.Tech -17PGEEEFT	17272H23	Power System Protection								
M.Tech -17PGEEEFT	17272E24A	Flexible AC Transmission system								
M.Tech -17PGEEEFT	17272E25B	AI Techniques to Power Systems					✓			
M.Tech -17PGEEEFT	17272L26	Power System Simulation Lab-II								
M.Tech -17PGEEEFT	172TECWR	Technical Writing/Seminars					✓			
M.Tech -17PGEEEFT	17272CRM	Research Methodology								
M.Tech -17PGEEEFT	17272CBR	Participation in Bounded Research								
M.Tech -17PGEEEFT	17272H31	Electrical Transients in power systems					✓			
M.Tech -17PGEEEFT	17272E32A	Power Electronics applications in Power systems								
M.Tech -17PGEEEFT	17272E33A	Power Conditioning								
M.Tech -17PGEEEFT	17272E34B	Industrial Power system analysis and design								
M.Tech -17PGEEEFT	17272P35	Project work Phase-I								
M.Tech -17PGEEEFT	17272CSR	Design Project / Socio Technical Project (Scaffolded Research)								
M.Tech -17PGEEEFT	17272P44	Project work Phase-II								
M.Tech -17PGEEEPT	17248S11DP	Applied Mathematics For Electrical &Electronics Engineering					✓			
M.Tech -17PGEEEPT	17272H12P	System Theory								
M.Tech -17PGEEEPT	17272H13P	Power System Modeling and Analysis								

M.Tech -17PGEEEPT	17272L14P	Power System Simulation Lab-I								
M.Tech -17PGEEEPT	17272CRSP	Research Led Seminar					✓			
M.Tech -17PGEEEPT	17272H21P	EHV power transmission.								
M.Tech -17PGEEEPT	17272H22P	Power System Protection								
M.Tech -17PGEEEPT	17272E23AP	Flexible AC Transmission System								
M.Tech -17PGEEEPT	172TECWRP	Technical Writing/Seminars					✓			
M.Tech -17PGEEEPT	17272CRMP	Research Methodology								
M.Tech -17PGEEEPT	17272CBRP	Participation in Bounded Research								
M.Tech -17PGEEEPT	17272H31P	Economic Operations of Power Systems-I						✓		
M.Tech -17PGEEEPT	17272H32P	High Voltage Direct Current Transmission System								
M.Tech -17PGEEEPT	17272E33AP	Analysis of Inverters								
M.Tech -17PGEEEPT	17272L34P	Power System Simulation Lab-II								
M.Tech -17PGEEEPT	17272CSRP	Design Project / Socio Technical Project (Scaffolded Research)								
M.Tech -17PGEEEPT	17272H41P	Economic Operations Of Power Systems-II						✓		
M.Tech -17PGEEEPT	17272H42P	Electrical Transients in power systems								
M.Tech -17PGEEEPT	17272E43AP	Wind Energy conversion systems						✓		
M.Tech -17PGEEEPT	17272P44P	Project work Phase -I								
M.Tech -17PGEEEPT	17272E51BP	Power system Dynamics					✓			
M.Tech -17PGEEEPT	17272E52AP	Power Conditioning								
M.Tech -17PGEEEPT	17272E53AP	Software for Control system Design					✓			
M.Tech -17PGEEEPT	17272P61P	Project work Phase -II								

1.3.1SUPPORTING DOCUMENTS

Courses which address the Gender Sensitization, Human Values,

Professional Ethics, Environment and sustainability.

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

PROGRAM HANDBOOK

B.Tech PART TIME - R2017

Gender Sensitization and Human Values	
Professional Ethics	..
Human Values	
Environment and sustainability	
Professional Ethics & Human Values	

COURSE STRUCTURE

B. TECH PART TIME

EEE

R 2017

SEMESTER I

Sl. No	Subject Code	Subject Name	Periods Per Week L	T	P	C
1	17148S11P	Transforms and Partial Differential Equations	3	1	0	4
2	17153H12P	Control System	3	1	0	4
3	17153H13P	Circuit Analysis and Networks	3	1	0	4
4	17153H14P	Electronic circuits	3	0	0	3
5	17153H15P	Electrical Machines-I	4	0	0	4
Total No of Credits						**19**

SEMESTER II

S. No	Subject Code	Subject Name	Periods Per Week L	T	P	C
1	17148S21P	Numerical Methods	3	1	0	4
2	17150S22P	Optimization Techniques	3	0	0	3
3	17153H23P	Electrical Machines-II	3	1	0	4
4	17153H24P	Digital Electronics	3	1	0	4
5	17153H25P	Transmission and Distribution	4	0	0	4
Total No of Credits						**19**

SEMESTER III

S. No	Subject Code	Subject Name	Periods Per Week L	T	P	C
1	17148S31P	Probability and Statistics	3	1	0	4
2	17152S32P	Analog Integrated Circuits	3	1	0	4
3	17153H33P	Power Electronics	4	0	0	4
4	17153H34P	Measurements and Instrumentation	4	0	0	4
5	17153L35P	Machines Lab	0	0	3	2
Total No of Credits						**20**

SEMESTER IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17153H41P	Protection and switch gear	4	0	0	4
2	17153H42P	High Voltage DC Transmission	3	1	0	4
3	17153H43P	Solid State Drives	3	1	0	4
4	171--E44_P	Elective –I	4	0	0	4
5	17153L45P	Control System & Measurements Lab	0	0	3	2
Total No of Credits						**18**

SEMESTER V

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17153H51P	Power System Analysis	3	1	0	4
2	17153H52P	Power Quality	3	1	0	4
3	17153H53P	Special Electrical Machines	4	0	0	4
4	171--E54_P	Elective –II	4	0	0	4
5	17153L55P	Power Electronics & Drives Lab	0	0	3	2
Total No of Credits						**18**

SEMESTER VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17153H61P	Utilization of Electrical Energy	3	1	0	4
2	17153H62P	Solid State Relays	4	0	0	4
3	17153H63P	Power System Operation and Control	4	0	0	4
4	171--E64_P	Elective –III	4	0	0	4
5	17153L65P	Power Systems Lab	0	0	3	2
Total No of Credits						**18**

SEMESTER VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160S71P	Total Quality Management	3	0	0	3
2	17153H72P	Electrical Machine Design	3	1	0	4
3	17153H73P	Power Plant Engineering	4	0	0	4
4	171--E74_P	Elective –IV	3	0	0	3
5	17153P75P	Project Work	0	0	12	6
Total No of Credits						**20**

LIST OF ELECTIVES

ELECTIVE –I (IV SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	**Subject Code**	**Subject Name**	4	0	0	4
2	17153E44AP	Field Theory	4	0	0	4
3	17152E44BP	Fuzzy Logic and its applications	4	0	0	4
4	17153E44CP	BioMedical Instrumentation	4	0	0	4
5	17153E44DP	Modeling and Simulation of Solar Energy Systems	4	0	0	4

ELECTIVE –II (V SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17158E54AP	Environmental Science and Engineering	4	0	0	4
2	17152E54BP	Artificial Neural Networks	4	0	0	4
3	17153E54CP	Communication Engineering	4	0	0	4
4	17154E54DP	Robotics	4	0	0	4

ELECTIVE –III (VI SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160E64AP	Principles of Management	4	0	0	4
2	17160E64BP	Professional Ethics	4	0	0	4
3	17152E64CP	Integrated opto-Electronic Devices	4	0	0	4
4	17153E64DP	Computer Aided Design of Electrical Apparatus	4	0	0	4

ELECTIVE –IV (VII SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17153E74AP	Power system transients	3	0	0	3
2	17153E74BP	EHV AC and DC Transmission systems	3	0	0	3
3	17153E74CP	Fiber Optics and Laser Instruments	3	0	0	3
4	17153E74DP	Advanced Control systems	3	0	0	3

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

B.TECH FULL TIME

R 2017

SEMESTER -I

S.No	Course Code	Course Title	L	T	P	C
1	**17147S11**	Communicative English	5	1	0	4
2	**17148S12**	Engineering Mathematics - I	5	1	0	4
3	**17149S13**	Engineering Physics	5	1	0	4
4	**17149S14**	Engineering Chemistry	5	1	0	4
5	**17154S15**	Engineering Graphics	5	1	0	4
6	**17150S16**	Problem Solving and Python programming	5	1	0	4
7	**17150L17**	Problem Solving and Python Programming Laboratory	0	0	3	2
8	**17149L18**	Physics and Chemistry Laboratory	0	0	3	2
9	**171VEA19**	Value Education				1
	TOTAL CREDITS					**29**

SEMESTER – II

S.No	Course Code	Course Name	L	T	P	C
1	**17147S21**	Technical English	5	1	0	4
2	**17148S22A**	Engineering Mathematics - II	5	1	0	4
3	**17149S23B**	Physics for Electronics Engineering	5	1	0	4
4	**17149S24A**	Environmental Science and Engineering	5	1	0	4
5	**17153S25C**	Circuit Theory	5	1	0	4
6	**17154S26C**	Basic Civil and Mechanical Engineering	5	1	0	4
7	**17154L27**	Engineering Practices Laboratory	0	0	3	2
8	**17153L28C**	Electric Circuits Laboratory	0	0	3	2
9	**171ICA29**	Fundamentals of Indian Constitution and Economy				1
	TOTAL CREDITS					**29**

SEMESTER -III

S.No	Course Code	Course Name	L	T	P	C
1	**17149S31C**	Transforms and Partial Differential Equations	3	1	0	4
2	**17153C32**	Digital Logic Circuits	3	1	0	3
3	**17153C33**	Electromagnetic Theory	2	2	0	3
4	**17153C34**	Electrical Machines - I	2	2	0	3
5	**17153C35**	Electron Devices and Circuits	3	0	0	3
6	**17153C36**	Power Plant Engineering	3	0	0	3
7	**17153L37**	Electronics Laboratory	0	0	3	2
8	**17153L38**	Electrical Machines Laboratory - I	0	0	3	2
					TOTAL CREDITS	**23**

SEMESTER -IV

S.No	Course Code	Course Name	L	T	P	C
1	**17149C41C**	Numerical Methods	4	0	0	4
2	**17153C42**	Electrical Machines - II	2	2	0	3
3	**17153C43**	Transmission and Distribution	3	0	0	3
4	**17153C44**	Measurements and Instrumentation	3	0	0	3
5	**17153C45**	Linear Integrated Circuits and Applications	3	0	0	3
6	**17153C46**	Control Systems	3	2	0	4
7	**17153L47**	Electrical Machines Laboratory - II	0	0	4	2
8	**17153L48**	Linear and Digital Integrated Circuits Laboratory	0	0	4	2
9	**17153L49**	Technical Seminar	0	0	2	1
10	**17153CRS**	Research Led Seminar	0	0	0	1
					TOTAL CREDITS	**26**

SEMESTER-V

S.No	Course Code	Course Name	L	T	P	C
1	**17153C51**	Power System Analysis	3	0	0	3
2	**17153C52**	Microprocessors and Microcontrollers	3	0	0	3
3	**17153C53**	Power Electronics	3	0	0	3
4	**17153FE54_**	Free Elective - I*	3	0	0	3
5	**17153C55**	Digital Signal Processing	2	2	0	3
6	**17153C56**	Object Oriented Programming	3	0	0	3
7	**17153L57**	Control and Instrumentation Laboratory	0	0	3	2
8	**17153L58**	Object Oriented Programming Laboratory	0	0	3	2
9	**17153L59**	Professional Communication	0	0	2	1
10	**17153CRM**	Research Methodology	3	0	0	3
				TOTAL CREDITS		**26**

SEMESTER VI

S.No	Course Code	Course Name	L	T	P	C
1	**17153C61**	Solid State Drives	3	0	0	3
2	**17153C62**	Protection and Switchgear	3	0	0	3
3	**17153C63**	Embedded Systems	3	0	0	3
4	**17153E64_**	Elective - I	3	0	0	3
5	**17153E65___**	Elective - II	3	0	0	3
6	**17153L66**	Power Electronics and Drives Laboratory	0	0	3	2
7	**17153L67**	Microprocessors and Microcontrollers Laboratory	0	0	3	2
8	**17153MP68**	Mini Project	0	0	4	2
9	**17153CBR**	Participation in Bounded Research	0	0	0	2
				TOTAL CREDITS		**23**

SEMESTER -VII

S.No	Course Code	Course Name	L	T	P	C
1	**17153C71**	High Voltage Engineering	3	0	0	3
2	**17153C72**	Power System Operation and Control	3	0	0	3
3	**17153C73**	Renewable Energy Systems	3	0	0	3
4	**17153FE74_**	Free Elective -II	3	0	0	3
5	**17153E75_**	Elective - III	3	0	0	3
6	**17153E76_**	Elective - IV	3	0	0	3
7	**17153L77**	Power System Simulation Laboratory	0	0	3	2
8	**17153L78**	Renewable Energy Systems Laboratory	0	0	3	2
9	**17153CSR**	Participation in Scaffolded Research (Design / Socio Technical Project)	0	0	0	4
					TOTAL CREDITS	**26**

SEMESTER-VIII

S.No	Course Code	Course Name	L	T	P	C
1.	**17153E81_**	Elective - V	3	0	0	3
2.	**17153E82_**	Elective - VI	3	0	0	3
3.	**17153P81**	Project Work	-	-	-	12
4.	**17153CEC**	Comprehensive Exit Course				2
			TOTAL CREDITS			**20**

LIST OF ELECTIVES

ELECTIVE –I (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	**17153E64A**	Advanced Control System	2	2	0	3
2.	**17153E64B**	Visual Languages and Applications	3	0	0	3
3.	**17153E64C**	Design of Electrical Apparatus	3	0	0	3
4.	**17153E64D**	Power Systems Stability	3	0	0	3
5.	**17153E64E**	Modern Power Converters	3	0	0	3
6.	**17153E64F**	Intellectual Property Rights	3	0	0	3

ELECTIVE –II (VI SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1.	**17153E65A**	Principles of Robotics	3	0	0	3
2.	**17153E65B**	Special Electrical Machines	3	0	0	3
3.	**17153E65C**	Power Quality	3	0	0	3
4.	**17153E65D**	EHVAC Transmission	3	0	0	3
5.	**17153E65E**	Communication Engineering	3	0	0	3

ELECTIVE –III (VIISEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	**17153E75A**	Disaster Management	3	0	0	3
2	**17153E75B**	Human Rights	3	0	0	3
3	**17153E75C**	Operations Research	3	0	0	3
4	**17153E75D**	Probability and Statistics	3	0	0	3
5	**17153E75E**	Fiber Optics and Laser Instrumentation	3	0	0	3

ELECTIVE –IV (VIIISEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	**17153E76A**	System Identification and Adaptive Control	3	0	0	3
2	**17153E76B**	Computer Architecture	3	0	0	3
3	**17153E76C**	Control of Electrical Drives	3	0	0	3
4	**17153E76D**	VLSI Design	3	0	0	3
5	**17153E76E**	Power Systems Transients	3	0	0	3
6	**17153E76F**	Total Quality Management	3	0	0	3

ELECTIVE – V (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	**17153E81A**	Flexible AC Transmission Systems	3	0	0	3
2	**17153E81B**	Soft Computing Techniques	3	0	0	3
3	**17153E81C**	Power Systems Dynamics	3	0	0	3
4	**17153E81D**	SMPS and UPS	3	0	0	3
5	**17153E81E**	Electric Energy Generation, Utilization and Conservation	3	0	0	3
6	**17153E81F**	Professional Ethics in Engineering	3	0	0	3
7	**17153E81G**	Principles of Management	3	0	0	3

ELECTIVE – VI (VIII SEMESTER)

S.No	Course Code	Course Name	L	T	P	C
1	**17153E82A**	Energy Management and Auditing	3	0	0	3
2	**17153E82B**	Data Structures	3	0	0	3
3	**17153E82C**	High Voltage Direct Current Transmission	3	0	0	3
4	**17153E82D**	Microcontroller Based System Design	3	0	0	3
5	**17153E82E**	Smart Grid	3	0	0	3
6	**17153E82F**	Biomedical Instrumentation	3	0	0	3
7	**17153E82G**	Fundamentals of Nano Science	3	0	0	3

FREE ELECTIVE -I (V SEM)

S.No	Course Code	Course Name	L	T	P	C
1	**17150FE54A**	Database Management System	3	0	0	3
2	**17152FE54A**	Basics of Biomedical Instrumentation	3	0	0	3
3	**17154FE54A**	Renewable Energy Sources	3	0	0	3
4	**17155FE54A**	Air Pollution and Control Engineering	3	0	0	3
5	**17150FE54B**	Cloud computing	3	0	0	3
6	**17152FE54B**	Sensors and Transducers	3	0	0	3

7	**17154FE54B**	Automatic System	3	0	0	3
8	**17155FE54B**	Geographic Information System	3	0	0	3

FREE ELECTIVE-II (VII SEM)

S.No	Course Code	Course Name	L	T	P	C
1	**17150FE74A**	Introduction to C Programming	3	0	0	3
2	**17152FE74A**	Robotics	3	0	0	3
3	**17154FE74A**	Industrial safety	3	0	0	3
4	**17155FE74A**	Green Building Design	3	0	0	3
5	**17150FE74B**	Datastructures and Algorithms	3	0	0	3
6	**17152FE74B**	Electronic Devices	3	0	0	3
7	**17154FE74B**	Testing of Materials	3	0	0	3
8	**17155FE74B**	Waste water Treatment	3	0	0	3

FREE ELECTIVE –III (VI SEMESTER)

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	17160E64AP	Principles of Management	4	0	0	4
2	17160E64BP	Professional Ethics	4	0	0	4
3	17152E64CP	Integrated opto-Electronic Devices	4	0	0	4
4	17153E64DP	Computer Aided Design of Electrical Apparatus	4	0	0	4

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

COURSE STRUCTURE

M.TECH-POWER SYSTEMS (FULL TIME) [Regulation2017]

SEMESTER – I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11D	Applied Mathematics For Electrical &Electronics Engineering	3	1	0	4
2	17272H12	System Theory	3	1	0	4
3	17272H13	Power System Modeling and Analysis	3	1	0	4
4	17272H14	Economic Operations of Power Systems-I	3	1	0	4
5	17272H15	High Voltage Direct Current Transmission System	3	1	0	4
6	17272E16_	Elective-I	3	1	0	4
7	17272L17	Power System Simulation Lab-I	0	0	3	3
8	17272CRS	Research Led Seminar				1
		TOTAL				28

SEMESTER – II

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21	EHV power transmission	3	1	0	4
2	17272H22	Economic Operations of Power Systems-II	3	1	0	4
3	17272H23	Power System Protection	3	1	0	4
4	17272E24_	Elective –II	3	1	0	4
5	17272E25_	Elective –III	3	1	0	4
6	17272L26	Power System Simulation Lab-II	0	0	3	3
7	172TECWR	Technical Writing/Seminars	0	0	3	3
8	17272CRM	Research Methodology				3
9	17272CBR	Participation in Bounded Research				2
		TOTAL				31

SEMESTER – III

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31	Electrical Transients in power systems	3	1	0	4
2	17272E32_	Elective –IV	3	1	0	4
3	17272E33_	Elective –V	3	1	0	4
4	17272E34_	Elective –VI	3	1	0	4
5	17272P35	Project work Phase-I	0	0	6	6
6	17272CSR	Design Project / Socio Technical Project (Scaffolded Research)				4
		TOTAL				26

SEMESTER – IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272P44	Project work Phase-II	0	0	12	12

Total Credits = 97

Elective –I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E16A	Analysis of Inverters	3	1	0	4
2.	17272E16B	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective –II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E24A	Flexible AC Transmission system	3	1	0	4
2.	17272E24B	Power System Planning and Reliability	3	1	0	4

Elective –III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E25A	Wind Energy conversion systems	3	1	0	4
2.	17272E25B	AI Techniques to Power Systems	3	1	0	4

Elective –IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E32A	Power Electronics applications in Power systems	3	1	0	4
2.	17272E32B	Power system Dynamics	3	1	0	4

Elective –V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33A	Power Conditioning	3	1	0	4
2.	17272E33B	Power system restructuring and deregulation	3	1	0	4

Elective –VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E34A	Software for Control system Design	3	1	0	4
2.	17272E34B	Industrial Power system analysis and design	3	1	0	4

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENTOF ELECTRICAL& ELECTRONICS ENGINEERING

PROGRAM COURSE STRUCTURE R2017

M.TECH-POWERSYSTEMS(PART TIME) [Regulation2017]

[for candidates admitted to M.Tech PowerSystem program from June 2022 onwards]

SEMESTER – I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11DP	Applied Mathematics For Electrical &Electronics Engineering	3	1	0	4
2.	17272H12P	System Theory	3	1	0	4
3.	17272H13P	Power System Modeling and Analysis	3	1	0	4
4.	17272L14P	Power System Simulation Lab-I	0	0	3	3
5.	17272CRSP	Research Led Seminar				1
		TOTAL				16

SEMESTER – II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21P	EHV power transmission.	3	1	0	4
2	17272H22P	Power System Protection	3	1	0	4
3	17272E23_P	Elective-I	3	1	0	4
4	172TECWRP	Technical Writing/Seminars	0	0	3	3
5	17272CRMP	Research Methodology				3
6	17272CBRP	Participation in Bounded Research				2
		TOTAL				20

SEMESTER – III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31P	Economic Operations of Power Systems-I	3	1	0	4
2	17272H32P	High Voltage Direct Current Transmission System	3	1	0	4
3	17272E33_P	Elective -II	3	1	0	4
4	17272L34P	Power System Simulation Lab-II	0	0	3	3
5	17272CSRP	Design Project / Socio Technical Project (Scaffolded Research)				4
		TOTAL				19

SEMESTER – IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H41P	Economic Operations Of Power Systems-II	3	1	0	4
2	17272H42P	Electrical Transients in power systems	3	1	0	4
3	17272E43_P	Elective -III	3	1	0	4
4	17272P44P	Project work Phase -I	0	0	6	6
		TOTAL				18

SEMESTER – V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272E51_P	Elective –IV	3	1	0	4
2.	17272E52_P	Elective –V	3	1	0	4
3.	17272E53_P	Elective –VI	3	1	0	4
		TOTAL				12

SEMESTER – VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272P61P	Project work Phase -II	0	0	12	12

Total Credits = 87

Elective –I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E23AP	Flexible AC Transmission System	3	1	0	4
2.	17272E23BP	Power System Planning and Reliability	3	1	0	4

Elective –II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33AP	Analysis of Inverters	3	1	0	4
2.	17272E33BP	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective –III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E43AP	Wind Energy conversion systems	3	1	0	4
2.	17272E43BP	AI Techniques to Power Systems	3	1	0	4

Elective –IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E51AP	Power Electronics applications in Power systems	3	1	0	4

2.	17272E51BP	Power system Dynamics	3	1	0	4

Elective –V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E52AP	Power Conditioning	3	1	0	4
2.	17272E52BP	Power system restructuring and deregulation	3	1	0	4

Elective –VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E53AP	Software for Control system Design	3	1	0	4
2.	17272E53BP	Industrial Power system analysis and design	3	1	0	4

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE AND TECHNOLOGY

B.TECH -ELECTRICAL & ELECTRONICS ENGINEERING

PART TIME PROGRAMME

CURRICULUM FOR SEMESTER I TO VII

Regulation 2017

Semester – I

Sl. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17148S11P	Transforms and Partial Differential Equations	3	1	0	4	50	50	100
2	17153H12P	Control System	3	1	0	4	50	50	100
3	17153H13P	Circuit Analysis and Networks	3	1	0	4	50	50	100
4	17153H14P	Electronic circuits	3	0	0	3	50	50	100
5	17153H15P	Electrical Machines-I	4	0	0	4	50	50	100
Total No of Credits						19	Total Marks		500

Semester – II

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17148S21P	Numerical Methods	3	1	0	4	50	50	100
2	17150S22P	Computer Architecture	3	0	0	3	50	50	100
3	17153H23P	Electrical Machines-II	3	1	0	4	50	50	100
4	17153H24P	Digital Electronics	3	1	0	4	50	50	100
5	17153H25P	Transmission and Distribution	4	0	0	4	50	50	100
Total No of Credits						19	Total Marks		500

Semester – III

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17148S31P	Probability and Statistics	3	1	0	4	50	50	100
2	17152S32P	Analog Integrated Circuits	3	1	0	4	50	50	100
3	17153H33P	Power Electronics	4	0	0	4	50	50	100
4	17153H34P	Measurements and Instrumentation	4	0	0	4	50	50	100
5	17153L35P	Machines Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester –IV

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H41P	Protection and switch gear	4	0	0	4	50	50	100
2	17153H42P	High Voltage DC Transmission	3	1	0	4	50	50	100
3	17153H43P	Solid State Drives	3	1	0	4	50	50	100
4	171--E44_P	Elective –I	4	0	0	4	50	50	100
5	17153L45P	Control System & Measurements Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester – V

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H51P	Power System Analysis	3	1	0	4	50	50	100
2	17153H52P	Power Quality	3	1	0	4	50	50	100
3	17153H53P	Special Electrical Machines	4	0	0	4	50	50	100
4	171--E54_P	Elective –II	4	0	0	4	50	50	100
5	17153L55P	Power Electronics & Drives Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester –VI

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153H61P	Utilization of Electrical Energy	3	1	0	4	50	50	100
2	17153H62P	Solid State Relays	4	0	0	4	50	50	100
3	17153H63P	Power System Operation and Control	4	0	0	4	50	50	100
4	171--E64_P	Elective –III	4	0	0	4	50	50	100
5	17153L65P	Power Systems Lab	0	0	3	2	50	50	100
Total No of Credits						18	Total Marks		500

Semester –VII

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17160S71P	Total Quality Management	3	0	0	3	50	50	100
2	17153H72P	Electrical Machine Design	3	1	0	4	50	50	100
3	17153H73P	Power Plant Engineering	4	0	0	4	50	50	100
4	171--E74_P	Elective –IV	3	0	0	3	50	50	100
5	17153P75P	Project Work	0	0	12	6	100	100	200
					Total No of Credits	20	Total Marks		600

Total No of Credits from Semester I to VII – 170

LIST OF ELECTIVES
Elective I

Semester – IV

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153E44AP	Field Theory	3	1	0	4	50	50	100
2	17152E44BP	Fuzzy Logic and its applications	3	1	0	4	50	50	100
3	17153E44CP	BioMedical Instrumentation	4	0	0	4	50	50	100
4	17153E44DP	Modeling and Simulation of Solar Energy Systems	4	0	0	4	50	50	100

Elective II

Semester – V

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17158E54AP	Environmental Science and Engineering	4	0	0	4	50	50	100
2	17152E54BP	Artificial Neural Networks	4	0	0	4	50	50	100
3	17153E54CP	Communication Engineering	4	0	0	4	50	50	100
4	17154E54DP	Robotics	3	1	0	4	50	50	100

Elective III

Semester – VI

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17160E64AP	Principles of Management	4	0	0	4	50	50	100
2	17160E64BP	Professional Ethics	4	0	0	4	50	50	100
3	17152E64CP	Integrated opto-Electronic Devices	3	1	0	4	50	50	100
4	17153E64DP	Computer Aided Design of Electrical Apparatus	3	1	0	4	50	50	100

Elective IV

Semester – VII

S. No	Subject Code	Subject Name	Periods Per Week			C	IA	UE	TM
			L	T	P				
1	17153E74AP	Power system transients	3	0	0	3	50	50	100
2	17153E74BP	EHV AC and DC Transmission systems	3	0	0	3	50	50	100
3	17153E74CP	Fiber Optics and Laser Instruments	3	0	0	3	50	50	100
4	17153E74DP	Advanced Control systems	3	0	0	3	50	50	100

17148S11P-TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

3 1 0 4

(Common to all) **SEMESTER-1**

UNIT I FOURIER SERIES 9 + 3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9 + 3hrs

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

UNIT III Z -TRANSFORM AND DIFFERENCE EQUATIONS 9 + 3hrs

Z-transform - Elementary properties (without proof) – Inverse Z – transform – Convolution theorem -Formation of difference equations – Solution of difference equations using Z –transform- Sampling of signals –an introduction.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 9 + 3hrs

Formation of pde –solution of standard type first order equation- Lagrange's linear equation – Linear partial differential equations of second order and higher order with Constant coefficients.

UNIT V BOUNDARY VALUE PROBLEMS 9 + 3hrs

Solutions of one dimensional wave equation – One dimensional heat equation – Steady state solution of two-dimensional heat equation (Insulated edges excluded) – Fourier series solutions in Cartesian coordinates. **Total no of hrs: 60hrs**

<u>TEXT BOOKS</u>

1. Andrews, L.A., and Shivamoggi B.K., "Integral Transforms for Engineers and Applied

   Mathematicians", Macmillen , New York ,1988.
2. Grewal, B.S., "Higher Engineering Mathematics", Thirty Sixth Edition, Khanna Publishers,

   Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume

   III", S. Chand & Company ltd., New Delhi, 1996.

REFERENCE BOOKS

1. Narayanan, S., Manicavachagom Pillay, T.K. and Ramanaiah, G., “Advanced Mathematics for Engineering Students”, Volumes II and III, S. Viswanathan (Printers and Publishers) Pvt. Ltd. Chennai, 2002.
2. Churchill, R.V. and Brown, J.W., “Fourier Series and Boundary Value Problems”, Fourth Edition, McGraw-Hill Book Co., Singapore, 1987.
3. Advanced Modern Engineering mathematics – Glyn James

17153H12P - CONTROL SYSTEM 3 1 0 4

SEMESTER-1

AIM

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

OBJECTIVES

i. To understand the methods of representation of systems and getting their transfer function models.
ii. To provide adequate knowledge in the time response of systems and steady state error analysis.
iii. To give basic knowledge is obtaining the open loop and closed–loop frequency responses of systems.
iv. To understand the concept of stability of control system and methods of stability analysis.
v. To study the three ways of designing compensation for a control system.

UNIT I: INTRODUCTION 12

Open-loop and closed –loop systems, servomechanisms and regulator systems; Transfer function; Block diagram reduction, Signal flow graphs.

UNIT II: MATHEMATICAL MODELS OF PHYSICAL SYSTEMS 12

Mechanical systems - Translational and Rotational systems, Gear trains, Electrical systems, Thermal systems and Fluid systems.

Components of feedback control systems - Potentiometers as error sensing devices, Synch, Servomotors, Stepper motors, Tachogenerators.

UNIT III: STABILITY 12

Concept of Stability, necessary and sufficient conditions of Stability, Closed-loop systems, merits and demerits, Routh-Hurwitz Criterion.

Transient Response: Typical inputs, convolution integral, Time domain specifications, steady state errors.

State equation – Solutions – Realization – Controllability – Observability – Stability Jury's test.

UNIT IV: FREQUENCY RESPONSE 12

Definition, equivalence between transient response and frequency response, Bode plots.

Nyquist Stability Criterion: Development of criterion, gain and phase margins, m- circles and Nichol's chart.

UNIT V: ROOT LOCUS METHOD 12

Rules for sketching of root loci, Root contours.

Synthesis: Lag and Lead networks, proportional, derivative and integral controllers.

MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM:

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control.

Total = 60

TEXT BOOK:

1. I.J.Nagrath and M.Gopal, ‘Control System Engineering’, Wiley Eastern Ltd., Reprint 1995.

REFERENCES:

1. M.Gopal, ‘Control System Principles and Design’, Tata McGraw Hill, 1998.
2. Ogatta, ‘Modern Control Engineering’, Tata McGraw Hill 1997.

17153H13P - CIRCUIT ANALYSIS AND NETWORKS

3 1 0 4

AIM

SEMESTER-1

To know about basic analysis and synthesis techniques used in electronics and communications.

OBJECTIVES

• To study about various network theorems and the method of application to analyse a circuit.
• To know the concept of transfer function of a network and the nature of response to external inputs.
• To synthesize a network in different forms from the transfer function.
• To know the concept and design of frequency selective filters.

UNIT-I BASIC CIRCUIT CONCEPTS & SINUSOIDAL ANALYSIS (12hrs)

Linear passive circuit elements, ideal sources (independent and dependent), V-I relationship of circuit elements –Ohm's Law - Kirchoff's Laws – analysis of series and parallel circuits – network reduction: voltage and current division, source transformation, star/delta transformation Concept of phasor and complex Impedance / Admittance – Analysis of simple series and parallel circuits – active power, reactive power, apparent power (volt -ampere), power factor– phasor diagram, impedance triangle and power triangle associated with these circuits – resonance in series and parallel circuits

UNIT-II CIRCUIT ANALYSIS & NETWEORK THEOREMS (12hrs)

Formation of matrix equations and analysis by using Mesh-current and Node-voltage methods. Superposition theorem – Thevenin's theorem – Norton's theorem - Maximum power transfer theorem - Reciprocity theorem – Compensation theorem – Substitution theorem - Millman's theorem and Tillage's theorem with applications.

Coupled circuits: self inductance - mutual inductance – coefficient of coupling – dot convention – analysis of simple coupled circuits. Equivalent inductance of the series aiding and opposing, parallel aiding and opposing coupled circuits.

UNIT-III THREE PHASE CIRCUIT AND TRANSIENT ANALYSIS (12hrs)

Three-phase systems – phase sequence - Solution of three-phase balanced circuits (Star& Delta) – Solution of three-phase unbalanced circuits (Star & Delta) - Power measurement and two-wattmeter method.
Forced and free response of RL, RC and RLC circuits with D.C. and sinusoidal excitations.

UNIT-IV TWO PORT NETWORKS (12hrs)

Characterization of two port networks in terms of Z, Y, H and T parameters – networks equivalents – relations between network parameters – Analysis of T, Ladder, Bridged–T and lattice networks – transfer function of terminated two port networks.

UNIT-V NETWORK TOPOLOGY, FILTERS & ATTENUATORS (12hrs)

Network graphs, tree and cut – sets – tie set and cut – set schedules – primitive impedance and admittance matrices

Classification of Filters - filter networks - design of constant K, m–derived and composite filters. Analysis of T,π, lattice, bridged-T, and L type attenuators.

TOTAL 60

TEXT BOOKS:

1. Basic Electrical and Electronics Engineering – Muthu subramaniyam
2. Nageswara rao
3. Umesh sinha
4. Charavarthi
1. Sudhakar. A., and Shyammohan, "Circuits and Networks Analysis and Synthesis" Tata McGraw Hill Publishing Co.Ltd. New Delhi, 1994.
2. Roy Choudhury, "Networks and Systems", New Age International Ltd.

17153H14P- ELECTRONIC CIRCUITS

3 0 0 3
SEMESTER-1

AIM:
To study the characteristics and applications of electronic devices.
OBJECTIVES:

- To acquaint the students with construction, theory and characteristics of the following electronic devices:
- Bipolar transistor, Field Effect transistor, Multivibrators, Power control/regulator devices, Feedback amplifiers and oscillators

UNIT I -RECTIFIER & POWER SUPPLY 12
Half & Full wave rectifier – filters – shunt , inductor, LC section & Ripple factor, P calculation for C, L and LC filters – Voltage regulators – Zener –Series voltage regulator – SMPS.
UNIT II- AMPLIFIERS 12
Amplifiers – Frequency response of RC coupled - Frequency Response of Emitter follower, gain band width product – FET amplifier at low and high frequency cascaded amplifiers.
UNIT III- FEEDBACK AMPLIFER & OSCILLATORS 12
Four basic types of feedback – effect of feedback on amplifier performance – condition for oscillation – Barkhunsen criteria – LC oscillators – Hartley & Colpitts – RC oscillators – Wein bridge, RC phase shift crystal oscillator.
UNIT IV- MULTIVIBRATORS 12
Collector coupled & Emitter coupled Astable multivibrator – Monostable, Bistable multivibrator – triggering methods – Storage delay and calculation of switching time – Schmitt triggering circuits – Speed up capacitor in switching.
UNIT V- POWER AMPLIFIER 12
Classification – class A, B, C & AB – Class B push pull – Class B Complimentary – symmetry – Class S, Power sections classification – Efficiency – Distortion in amplifiers.

L = 45 T = 15 P = 0 TOTAL =60

REFERENCE BOOKS:

1. David.A.Bell, “Solid State Pulse Circuits”, Prentice Hall of India, 4th Edition, 2001.
2. Millman Taub.H, “Pulse Digital & Switching waveform”, Tata McGRaw Hill International 2001.
3. Jacob Millman Cristas C.Halkias, “Integrated Electronics”, Tat Mc Graw Hill, Edition 1991.

17153H15P- ELECTRICAL MACHINES – I 4 0 0 4

AIM **SEMESTER-1**

To expose the students to the concepts of electromechanical energy conversions in D.C. Machines and energy transfer in transformers and to analyze their performance.

OBJECTIVES

i. To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.
ii. To understand the generation of D.C. voltages by using different type of generators and study their performance.
iii. To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.
iv. To familiarize with the constructional details of different type of transformers, working principle and their performance.
v. To estimate the various losses taking place in D.C. machines and transformers and to study the different testing method to arrive at their performance.

UNIT I: BASIC PRINCIPLES OF ROTATING MACHINES 12

Electrical machine types – Magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits - core losses. Principles of Electromechanical energy conversion: Energy conversion process – Energy in magnetic system – Field energy and mechanical force – Multiply excited magnetic field systems

UNIT II: GENERATORS 12

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNIT III: DC MOTORS 12

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters – Speed control of DC series and shunt motors.

UNIT IV: TRANSFORMERS 12

Constructional details of core and shell type transformers – Types of windings – Principle of operation – emf equation – Transformation ratio - Equivalent circuit – Losses – Testing – Efficiency and Voltage regulation .

Transformer on load– Parallel operation of single phase transformers – Auto transformer – Three phase transformers

UNIT V: TESTING OF TRANSFORMERS AND DC MACHINES 12

Losses and efficiency in DC machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne’s test, Retardation test and Hopkinson’s test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests – All day efficiency.

TOTAL = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.

2. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.

2. J .B.Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.

3. K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

4. V.K.Mehta and Rohit Mehta, 'Principles of Power System', S.Chand and Company Ltd, third edition, 2003.

17148S21P-NUMERICAL METHODS

3 1 0 4

Semester II

UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS

9+3hrs

Solution of equations–Newton Raphson's method, Regula-falsi methods Solution of linear System of equations by Gaussian elimination and Gauss-Jordon methods- Iterative methods: Gauss Jacobi and Gauss-Seidel methods– Eigenvalue of a matrix by power method.

UNIT II- INTERPOLATION 9+3hrs

Newton's forward and backward difference formulas – Central difference formula: Bessels and Stirling's formula - Lagrangian Polynomials – Divided difference method.

UNIT III- NUMERICAL DIFFERENTIATION AND INTEGRATION

9+3hrs

Derivatives from difference tables – Divided differences and finite differences – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integrals using trapezoidal and Simpson's rules.

UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9+3hrs

Single step methods: Taylor series method – Euler and modified Euler methods – Fourth order Runge – Kutta method for solving first and second order equations – Multistep methods: Milne's and Adam's predictor and corrector methods.

UNIT V - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 9+3hrs

Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional wave equation and two dimensional Laplace and Poisson equations.

Total no of hrs: 60hrs

TEXT BOOKS

1. Gerald, C.F, and Wheatley, P.O, "Applied Numerical Analysis", Sixth Edition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy, K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.

REFERENCES BOOKS

1. Burden, R.L and Faires, T.D., "Numerical Analysis", Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

17150S22P- COMPUTER ARCHITECTURE

3 0 0 3
SEMESTER II

AIM:
To understand the architecture of different processor and its associative units

OBJECTIVES:
To provide a clear understanding of
- Computer arithmetic and logic unit design.
- Control Mechanism and CPU functioning.
- Pipeline architecture and vector processing.
- Input and output organizations and interfacing.
- Various memories and their organization.56

UNIT I BASIC STRUCTURE OF COMPUTERS 9
Functional units – Basic operational concepts – Bus structures – Performance and Metrics – Instruction and instruction sequencing – hardware – software interface – addressing modes – instruction set – RISC – CISC – ALU design – fixed point and floating point operation.

UNIT II CONTROL AND CENTRAL PROCESSING UNIT 9
Micro programmed control – Control memory, address sequencing, micro program example, and design of control unit. Central processing unit – general register rganization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

UNIT III COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9
Computer arithmetic – addition and subtraction, multiplication algorithms, division algorithms, floating point arithmetic operations decimal arithmetic unit, decimal arithmetic operations. Pipeline and vector processing – Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, vector processing array processors.

UNIT IV INPUT OUTPUT ORGANIZATION 9
Input output organization : peripheral devices, input output interface, asynchronous data transfer , modes of transfer, priority interrupt, direct memory access, input output interface, serial communication.

UNIT V MEMORY ORGANIZATION 9
Memory organization – memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Morris Mano, ‘Computer system architecture’, 3rd edition, Pearson education 2002
2. Behrooz Parhami, ‘Computer Architecture’, Oxford University Press, 2005.

REFERENCES:
1. Vincent P. Heuring and Harry F. Jordan, ‘ Computer systems design and architecture’, Pearson Education Asia Publications, 2004.
2. John P. Hayes , ‘ Computer Architecture and Organization’, Tata McGraw-Hill, 1988.
3. Andrew S Tannenbaum ‘ Structured Computer Organization ‘, 5th edition Pearson Education 2007.
4. William Stallings ,’ Computer Organization and architecture’, 7th edition Pearson Education 2006.

Semester II

17153H23P-ELECTRICAL MACHINES-II

3 1 0 4

AIM:

To expose the students to the concepts of synchronous and asynchronous machines and
analyze their performance.

OBJECTIVES:

To impart knowledge on

i. Construction and performance of salient and non – salient type synchronous generators.
ii. Principle of operation and performance of synchronous motor.
iii. Construction, principle of operation and performance of induction machines.
iv. Starting and speed control of three-phase induction motors.
v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNIT I: SYNCHRONOUS GENERATOR 12

Constructional details – Types of rotors – emf equation – Synchronous reactance – Armature reaction – Voltage regulation – e.m.f, m.m.f, z.p.f and A.S.A methods – Synchronizing and parallel operation – Synchronizing torque - Change of excitation and mechanical input – Two reaction theory – Determination of direct and quadrature axis synchronous reactance using slip test – Operating characteristics - Capability curves.

UNIT II: SYNCHRONOUS MOTOR 12

Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

UNIT III: THREE PHASE INDUCTION MOTOR 12

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors

UNIT IV: STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12

Need for starting – Types of starters – Stator resistance and reactance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, torque, number of poles and slip – Cascaded connection – Slip power recovery scheme.

UNIT V: SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINE 12

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test — Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor

Total = 60

TEXT BOOKS

1. D.P. Kothari and I.J. Nagrath, ‘Electric Machines’, Tata McGraw Hill Publishing Company Ltd, 2002.
2. P.S. Bhimbhra, ‘Electrical Machinery’, Khanna Publishers, 2003.

REFERENCE BOOKS

1. A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, ‘Electric Machinery’, Tata McGraw Hill publishing Company Ltd, 2003.
2. J.B. Gupta, ‘Theory and Performance of Electrical Machines’, S.K.Kataria and Sons, 2002.
3. K. Murugesh Kumar, ‘Electric Machines’, Vikas publishing house Pvt Ltd, 2002.
4. Sheila.C.Haran, ‘Synchronous, Induction and Special Machines’, Scitech Publications, 2001.

Semester II

17153H24P-DIGITAL ELECTRONICS

3 1 0 4

AIM:

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

OBJECTIVES:

i. To study various number systems and to simplify the mathematical expressions using Boolean functions simple problems.

ii. To study implementation of combinational circuits

iii. To study the design of various synchronous and asynchronous circuits.

iv. To expose the students to various memory devices.

UNIT I NUMBER SYSTEMS **12**

Review of Binary, Octal and Hexa-decimal number systems – Conversions, Binary Arithmetic magnitude form – 1's, 2's complement representation, Codes: -BCD, Excess – 3, Graycode, ASCII codes, Error detecting codes (Hamming code)

UNIT II BOOLEAN ALGEBRA **12**

Boolean Algebra - De Morgan's law – Simplifications of Boolean expression – sum of Products and product of sums – Karnaugh Map – Quince McClusky method of simplification (Including Don't care conditions)

UNIT III Combinational Logic **12**

Design of Logic gates- Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

UNIT IV Sequential Logic Design **12**

Building blocks of Sequential logic – RS, JK, Master – Slave, D and T flip- flop, Asynchronous and synchronous counters – Binary and BCD counters – shift registers – Design and Implementation of Sequential synchronous circuits

UNIT V Logic Families

12

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

TOTAL = 60Hrs

TEXT BOOK:

1. Albert Paul, Malvino and Donald.P.Leach , “Digital Principles and Applications”, McGraw Hill Publications.
2. Floyd, “Digital Fundamentals”, Universal Book Stall, New Delhi,1993.
3. Moris Mano, “Digital Electronics and Design “, Prentice Hall of India, 2000.

REFERENCE:

1. “Digital Logic & Computer Design”, Prentice Hall of India, 2000.

17153H25P-TRANSMISSION AND DISTRIBUTION 4 0 0 4

Semester II

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

i. To develop expression for computation of fundamental parameters of lines.
ii. To categorize the lines into different classes and develop equivalent circuits for these classes.
iii. To analyze the voltage distribution in insulator strings and cables and methods to improve the same.

UNIT I: INTRODUCTION 12

Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability.

Radial and ring-main distributors; interconnections; AC distribution: AC distributor with concentrated load; three-phase, four-wire distribution system; sub-mains; stepped and tapered mains.

UNITII:TRANSMISSION LINE PARAMETERS 12

Resistance, Inductance and Capacitance of single and three phase transmission lines -Stranded and Bundled conductors -Symmetrical and unsymmetrical spacing -Transposition -Application of self and mutual GMD -Skin and Proximity effect -Inductive interference with neighboring circuits.

UNIT III: MODELLING AND PERFORMANCE OF TRANSMISSION LINES 12

Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation; real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, loadability limits based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.

UNIT IV: INSULATORS AND CABLES 12

Insulators: Types, voltage distribution in insulator string and grading, improvement of string efficiency. Underground cables: Constructional features of LT and HT cables, capacitance, dielectric stress and grading, thermal characteristics.

UNIT V: DESIGN OF TRANSMISSION LINES 12

Introduction, calculation of sag and tension .Equivalent span length and sag, Effect of ice and wind loading ,Stringing chart, sag template, conductor vibrations and vibrations dampers

TOTAL =60

TEXT BOOKS

1. B.R.Gupta, ‘Power System Analysis and Design’, S.Chand, New Delhi, 2003.
2. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice

Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCE BOOKS

1. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Pearson Education, 1996.
2. Hadi Saadat, 'Power System Analysis,' Tata McGraw Hill Publishing Company', 2003.
3.Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4.'Tamil Nadu Electricity Board Handbook', 2003.

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17148S31P-PROBABILITY AND STATISTICS 3 1 0 4

(Common to Mech, Civil, EEE)

SEMESTER-III

UNIT I PROBABILITY AND RANDOM VARIABLE 9+3hrs

Axioms of probability - Conditional probability - Total probability - Bayes theorem - Random variable - Probability mass function - Probability density functions -Properties-Moments - Moment generating functions and their properties.

UNIT II TWO DIMENSIONAL RANDOM VARIABLES 9+3hrs

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

UNIT III STANDARD DISTRIBUTIONS 9+3hrs

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

UNIT IV TESTING OF HYPOTHESIS 9+3hrs

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

UNIT V DESIGN OF EXPERIMENTS 9+3hrs

Analysis of variance – One way classification – Complete randomized design - Two – way classification –Randomized block design - Latin square.

Note : Use of approved statistical table permitted in **Total no of hrs: 60hrs**

TEXT BOOKS

1. Ross. S., "A first Course in Probability", Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., "Miller & Freund's Probability and Statistics for Engineers", Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES BOOKS

1) Walpole, R. E., Myers, R. H. Myers R. S. L. and Ye. K, "Probability and Statistics for Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
2) Lipschutz. S and Schiller. J, "Schaum's outlines - Introduction to Probability and Statistics", McGraw-Hill, New Delhi, 1998.
3) Gupta, S.C, and Kapur, J.N., "Fundamentals of Mathematical Statistics", Sultan Chand, Ninth Edition , New Delhi ,1996.

Semester III

17152S32P- ANALOG INTEGRATED CIRCUITS 3 1 0 4

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of Ics.

OBJECTIVES

i. To study the IC fabrication procedure.
ii. To study characteristics; realize circuits; design for signal analysis using Op-amp Ics.
iii. To study the applications of Op-amp.
iv. To study internal functional blocks and the applications of special Ics like Timers, PLL circuits, regulator Circuits, ADCs.

UNIT I: IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic Ics and packaging.

UNIT II: CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer and subtractor – Multiplier and divider- differentiator and integrator.

UNIT III: APPLICATIONS OF OPAMP 9

Instrumentation amplifier, V/I & I/V converters, comparators, multivibrators, waveform generators, Precision rectifier, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter – Dual slope, successive approximation and flash types.

UNIT IV: ACTIVE FILTERS AND SPECIAL ICs 9

RC Active filters : low pass – high pass – band pass – band reject – switched capacitor filter – 555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier Ics**.**

UNIT V: APPLICATION ICs 9

IC voltage regulators – LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic Ics. **TOTAL = 45**

TEXT BOOKS

1. Ramakant A.Gayakward, ‘Op-amps and Linear Integrated Circuits’, IV edition, Pearson Education, 2003 / PHI.

2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.

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SEMESTER-III

17153H33P- POWER ELECTRONICS 4 0 0 4

AIM:
To understand the various applications of electronic devices for conversion, control and conditioning of the electrical power.

OBJECTIVES:
- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifiers
- To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
- To study the operation of AC voltage controller and Matrix converters.

UNIT I- POWER SEMI-CONDUCTOR DEVICES : 12
Overview of switching devices – Driver and snubber circuit of SCR TRIAC, GTO, IGBT,
MOSFET – Computer simulation of PE circuits.

UNIT II-PHASE CONTROLLED CONVERTERS 12
2 pulse / 3 pulse and 6 pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters.

UNIT III -DC TO DC CONVERTERS 12
Stepdown and stepup chopper – Forced commutation techniques – Time ratio control and current limit control – Switching mode regulators Buck, Boost, Buck-Boost – concept of resonant switching.

UNIT IV- INVERTERS 12
Single phase and three phase [120& 180mode] inverters – PWM techniques – Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM – Voltage and harmonic control – Series resonant inverter – current source inverter.

UNIT V- AC TO AC CONVERTERS 12
Single phase AC voltage controllers – Multistage sequence control – single phase and three phase cycloconverters – power factor control – Matrix converters.

L: 45 T: 15 TOTAL: 60 PERIODS

TEXT BOOKS:
1. Rashid M.H., "Power Electronics Circuits, Devices and Applications", Prentice Hall India, 3rd Edition, New Delhi, 2004.

2. Ned Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics: Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Cyril.W.Lander, "Power Electronics", McGraw Hill International, Third Edition, 1993.
2. P.S.Bimbra "Power Electronics", Khanna Publishers, third Edition 2003.
3. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

17153H34P-MEASUREMENTS AND INSTRUMENTATION

4 0 0 4

Semester III

AIM

To provide adequate knowledge in electrical instruments and measurements techniques.

OBJECTIVES

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working.

i. Introduction to general instrument system, error, calibration etc.
ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
iii. To have an adequate knowledge of comparison methods of measurement.
iv. Elaborate discussion about storage & display devices.
v. Exposure to various transducers and data acquisition system.

UNIT I: INTRODUCTION **10**

Functional elements of an Instrument -Static and Dynamic characteristics -Errors in measurement -Statistical evaluation of measurement data -Standard and Calibration.

UNIT II: ELECTRICAL AND ELECTRONICS INSTRUMENTS **12**

Construction and principle of operation of moving coil, moving Iron, Principle and types analog and digital ammeters and voltmeters -Single and three phase Wattmeter and Energy meter - magnetic measurements - -Instruments for measurement of frequency and phase.

UNIT III: SIGNAL CONDITIONING CIRCUITS **12**

Bridge circuits – Differential and Instrumentation amplifiers -Filter circuits - V/f and f/V converters – P/I and I/P converters – S/H Circuit, A/D and D/A converters -Multiplexing and De-multiplexing -Data acquisition systems –Grounding techniques.

UNIT IV: STORAGE AND DISPLAY DEVICES **12**

Magnetic disc and Tape Recorders -Digital plotters and printers -CRT displays -Digital CRO – LED, LCD and Dot matrix displays.

UNIT V: TRANSDUCERS **14**

Classification of Transducers -Selection of Transducers –Resistive, Capacitive and Inductive Transducers -Piezo electric Transducers -Transducers for measurement of displacement, temperature, level, flows, pressure, velocity, acceleration, torque, speed, viscosity and moisture.

Total = 60

TEXT BOOKS

1. E.O. Doebelin, ‘Measurement Systems – Application and Design’, Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2004.

REFERENCE BOOKS

1. A.J. Bouwens, ‘Digital Instrumentation’, Tata McGraw Hill, 1997.
2. D.V.S. Moorthy, ‘Transducers and Instrumentation’, Prentice Hall of India Pvt Ltd, 2003.
3. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw Hill, 1995.
4. Martin Reissland, ‘Electrical Measurements’, New Age International (P) Ltd., Delhi, 2001.
5. J. B. Gupta, ‘A Course in Electronic and Electrical Measurements’, S. K. Kataria & Sons, Delhi, 2003.

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17153L35P- MACHINES LAB **0 0 3 2**

Semester III

LIST OF EXPERIMENTS

1. Load test on DC Shunt & DC Series motor
2. O.C.C & Load characteristics of DC Shunt generator
3. Speed control of DC shunt motor (Armature, Field control)
4. Load test on single phase transformer
5. O.C & S.C Test on a single phase transformer
6. Regulation of an alternator by EMF & MMF methods.
7. V curves and inverted V curves of synchronous Motor
8. Load test on three phase squirrel cage Induction motor
9. Speed control of three phase slip ring Induction Motor
10. Load test on single phase Induction Motor.
11. Study of DC & AC Starters

TOTAL: 45

SEMESTER-IV

17153H41P- PROTECTION AND SWITCHGEAR

4 0 0 4

AIM

To expose the students to the various faults in power system and learn the various methods of protection scheme.
To understand the current interruption in Power System and study the various switchgears.

OBJECTIVES

i. Discussion on various earthling practices usage of symmetrical components to estimate fault current and fault MVA.
ii. Study of Relays & Study of protection scheme, solid state relays.
iii. To understand instrument transformer and accuracy.
iv. To understand the method of circuit breaking various arc theories Arcing phenomena – capacitive and inductive breaking.
v. Types of circuit breakers.

UNIT I: INTRODUCTION 12

Principles and need for protective schemes – nature and causes of faults – types of faults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNIT II: OPERATING PRINCIPLES AND RELAY CONSTRUCTIONS 12

Need for protection – essential qualities of protective relays – Electromagnetic relays, Induction relays – Over current relays - Directional, Distance, Differential and negative sequence relays. Static relays

UNIT III: APPARATUS PROTECTION 12

Apparatus protection transformer, generator, motor, protection of bus bars, transmission lines – CTs and PTs and their applications in protection schemes.

UNIT IV: THEORY OF CIRCUIT INTERRUPTION 12

Physics of arc phenomena and arc interruption. Restricting voltage & Recovery voltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNIT V: CIRCUIT BREAKERS 12

Types of Circuit Breakers – Air blast, Air break, oil SF_6 and Vacuum circuit breakers – comparative merits of different circuit breakers – Testing of circuit breakers

TEXT BOOKS

1. B. Ravindranath, and N. Chander, 'Power System Protection & Switchgear', Wiley Eastern Ltd., 1977.

REFERENCE BOOKS

1. Sunil S. Rao, 'Switchgear and Protection', Khanna publishers, New Delhi, 1986 .
2. C.L. Wadhwa, 'Electrical Power Systems', Newage International (P) Ltd., 2000.
3. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co., 1998.
4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw hill, 2001.
5. Y.G. Paithankar and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

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17153H42P-HIGH VOLTAGE DC TRANSMISSION

3 1 0 4

Semester IV

AIM:
To learn the HVDC modelling and control strategy.

OBJECTIVES:
 To study the performance of converters and modeling of DC line with controllers.
 To study about converter harmonics and its mitigation using active and passive filters.

UNIT I- DC POWER TRANSMISSION TECHNOLOGY 9
Introduction-comparison of AC and DC transmission application of DC transmission – Description of DC transmission system planning for HVDC transmission-modern trends In DC transmission.

UNIT II- ANALYSIS OF HVDC CONVERTERS 9
Pulse number, choice of converter configuration-simplified analysis of Graetz circuit converter bridge characteristics – characteristics of a twelve pulse converter-detailed analysis of converters.

UNIT III- CONVERTER AND HVDC SYSTEM CONTROL 9
General principles of DC link control-converter control characteristics-system control Hierarchy-firing angle control-current and extinction angle control-starting and stopping of DC link-power control-higher level controllers-telecommunication requirements.

UNIT IV -HARMONICS AND FILTERS 9
Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency and RI noise.

UNIT V -SIMULATION OF HVDC SYSTEMS 9
Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling of HVDC systems for digital dynamic simulation.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Padiyar, K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi 1990.First edition.
2. P.Kundur, ‘Power System Stability and Control’, Tata McGraw Hill Publishing Company Ltd., USA, 1994.
3. Arrillaga, J., High Voltage direct current transmission, Peter Pregrinus, London, 1983.

REFERENCES:

1. Edward Wilson Kimbark, Direct Current Transmission, Vol. I, Wiley interscience, New York, London, Sydney, 1971.
2. Rakosh Das Begamudre, Extra high voltage AC transmission engineering New

17153H43P- SOLID STATE DRIVES

3 1 0 4
Semester IV

AIM
To study and understand the operation of electric drives controlled from a power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

i. To understand the stable steady-state operation and transient dynamics of a motor-load system.
ii. To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.
iii. To study and understand the operation of both classical and modern induction motor drives.
iv. To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
v. To analyze and design the current and speed controllers for a closed loop solid-state d.c motor drive.

UNIT I DRIVE CHARACTERISTICS **9**

Equations governing motor load dynamics - Equilibrium operating point and its steady state stability - Mathematical condition for steady state stability and problems - Multi quadrant dynamics in the speed torque plane - Basics of regenerative braking - Typical load torque characteristics - Acceleration, deceleration, starting and stopping.

UNIT II DC MOTOR DRIVE **9**

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive: Continuous and discontinuous conduction mode - Chopper fed D.C drive: Time ratio control and current limit control - Operation of four quadrant chopper.

UNIT III STATOR CONTROLLED INDUCTION MOTOR DRIVES **9**

Variable terminal voltage control – Variable frequency control – V/f control - AC voltage controllers – Four-quadrant control and closed loop operation - Frequency controlled drives- VSI and CSI fed drives – closed loop control.

UNIT IV ROTOR CONTROLLED INDUCTION MOTOR DRIVES **9**

Rotor resistance control – slip power recovery schemes - sub synchronous and super synchronous operations – closed loop control – Braking in induction motors.

UNIT V- SYNCHRONOUS MOTOR DRIVES 9

Wound field cylindrical rotor motor – operation from constant voltage and frequency source – operation from current source – operation from constant frequency – Brushless excitation – Permanent magnet synchronous motor.

Self-controlled Synchronous motor drives – Brushless dc and ac motor drives – CSI with load commutation – Cycloconverter with load commutation.

TOTAL = 45

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.
2. Bimal K. Bose. 'Modern Power Electronics and AC Drives', Pearson Education, 2002.

REFERENCE BOOKS

1. G.K. Dubey, 'Power Semi-conductor Controlled Drives', Prentice Hall of India, 1989.
2. Vedam Subrahmanyam, "Electric drives concepts and applications", TMH Pub. Co.Ltd., 1994.
3. Murphy, J.M.D and Turnbull.F.G. , "Thyristor control of AC Motors", Pergamon Press, 1988.
4. Sen. P.C., "Thyristor D.C. Drives", John Wiley and Sons, 1981.

17153L45P- CONTROL SYSTEM & MEASUREMENTS LAB

0 0 3 2

Semester IV

AIM

To provide a platform for understanding the basic concepts of linear control theory and its application to practical systems and To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.

LIST OF EXPERIMENTS

1. Determination of transfer function parameters of a DC servo motor & AC servo motor.
2. Analog simulation of type-0 and type-1 system, closed loop control system.
3. Digital simulation of linear systems & non-linear systems.
4. Design of P, PI and PID controllers,
5. Design of compensators.
6. Stability analysis of linear systems
7. Conduct test to find unknown inductance & capacitance using Maxwell's & Schering's bridges
8. Conduct test to find unknown Resistance using Wheat Stone & Kelvin's bridges.
9. Instrumentation amplifiers,
10. Conduct test to convert A/D signal using successive approximation type.
11. a) Conduct test to convert D/A signal using binary weighted resistor method.
    b) Conduct test to convert D/A signal using R-2R Ladder method.
12. Calibration of single-phase energy meter & current transformer.

P = 45 Total = 45

17153H51P-POWER SYSTEM ANALYSIS

3 1 0 4
Semester V

AIM
To become familiar with different aspects of modeling of components and system and different methods of analysis of power system planning and operation.

OBJECTIVES

i. To model steady-state operation of large-scale power systems and to solve the power flow problems using efficient numerical methods suitable for computer simulation.
ii. To model and analyse power systems under abnormal (fault) conditions.
iii. To model and analyse the dynamics of power system for small-signal and large signal disturbances and o design the systems for enhancing stability.

UNIT I- THE POWER SYSTEM AN OVER VIEW AND MODELLING 12

Moder n Power System - Basic Components of a power system - Per Phase Analysis Generator model - Transformer model - line model. The per unit system -Change of base.

UNIT II- POWER FLOW ANALYSIS 12
Introduction - Bus Classification - Bus admittance matrix - Solution of non-linear Algebraic equations - Gauss seidal method - Newton raphson method - Fast decoupled method - Flow charts and comparison of the three methods.

UNIT III-FAULT ANALYSIS-BALANCED FAULT 12
Introduction – Balanced three phase fault – short circuit capacity – systematic fault analysis using bus impedance matrix – algorithm for formation of he bus impedance matrix.

UNIT IV-FAULT ANALYSIS – SYMMETRICAL COMPONENTS AND UNBALANCED FAULT 12
Introduction – Fundamentals of symmetrical components – sequence impedances – sequence networks – single line to ground fault – line fault - Double line to ground fault – Unbalanced fault analysis using bus impedance matrix.

UNIT V-POWER SYSTEM STABILITY 12
Dynamics of a Synchronous machine – Swing equation and Power angle equation – Steady state Stability and Transient state Stability - Equal area criterion – Cearing angle and time- Numerical solution of Swing equation for single machine

Total = 60 Hrs
TEXT BOOKS:
1. Hadi Saadat "Power system analysis", Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, "Power System Stability and Control", Tata McGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCE BOOKS:

1. I.J.Nagrath and D.P.Kothari, 'Modern Power System Analysis', Tata McGraw-Hill publishing company, New Delhi, 1990.
2. M.A. Pai, 'Computer Techniques in power system Analysis', Tata McGraw – Hill publishing company, New Delhi, 2003.
3. John J. Grainger and Stevenson Jr. W.D., 'Power System Analysis', McGraw Hill International Edition, 1994

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17153H52P - POWER QUALITY **3 1 0 4**

Semester V

UNIT I INTRODUCTION TO POWER QUALITY 3

Terms and definitions: Overloading, under voltage, sustained interruption; sags and swells; waveform distortion, Total Harmonic Distortion (THD), Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 7

Sources of sags and interruptions, estimating voltage sag performance, motor starting sags, estimating the sag severity, mitigation of voltage sags, active series compensators, static transfer switches and fast transfer switches.

UNIT III OVER VOLTAGES 10

Sources of over voltages: Capacitor switching, lightning, ferro resonance; mitigation of voltage swells: Surge arresters, low pass filters, power conditioners – Lightning protection, shielding, line arresters, protection of transformers and cables.

UNIT IV HARMONICS 12

Harmonic distortion: Voltage and current distortion, harmonic indices, harmonic sources from commercial and industrial loads, locating harmonic sources; power system response characteristics, resonance, harmonic distortion evaluation, devices for controlling harmonic distortion, passive filters, active filters, IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 17

Monitoring considerations: Power line disturbance analyzer, per quality measurement equipment, harmonic/spectrum analyzer, flicker meters, disturbance analyzer, applications of expert system for power quality monitoring.

L=45 Total=45

REFERENCE BOOKS

1. Roger.C.Dugan, Mark.F.McGranagham, Surya Santoso, H.Wayne Beaty, ‘Electrical Power Systems Quality’ McGraw Hill, 2003.
2. PSCAD User Manual.

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17153H53P- SPECIAL ELECTRICAL MACHINES **4 0 0 4**

Semester V

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

i. Construction, principle of operation and performance of synchronous reluctance motors.

ii. Construction, principle of operation and performance of stepping motors.

iii. Construction, principle of operation and performance of switched reluctance motors.

iv. Construction, principle of operation and performance of permanent magnet brushless D.C. motors.

v. Construction, principle of operation and performance of permanent magnet synchronous motors.

UNIT I-SYNCHRONOUS RELUCTANCE MOTORS **9**

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.

UNIT II -STEPPING MOTORS **9**

Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics – drive circuits.

UNIT III-SWITCHED RELUCTANCE MOTORS **9**

Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control - characteristics – computer control.

UNIT IV-PERMANENT MAGNET BRUSHLESS D.C. MOTORS **9**

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

UNIT V-PERMANENT MAGNET SYNCHRONOUS MOTORS **9**

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

L=45 Total=45

TEXT BOOKS

1. Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.

2. Aearnley, P.P., 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus, London, 1982.

REFERENCES

1. Kenjo, T., ‘Stepping Motors and their Microprocessor Controls’, Clarendon Press London, 1984.
2. Kenjo, T., and Nagamori, S., ‘Permanent Magnet and Brushless DC Motors’, Clarendon Press, London, 1988.

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17153L55P- POWER ELECTRONICS AND DRIVES LAB

Semester V

0 0 3 2

AIM

To study the characteristics of switching devices and its applications in rectifier inverter, chopper and resonant converter.

1. Study Of V-I Characteristics Of An SCR.
2. Study Of V-I Characteristics Of A TRIAC.
3. Study Of Different Trigerring Circuits For Thyristor.
4. Study Of Uni- Junction Transistor (UJT) Trigerring Circuit.
5. Study Of A Firing Circuit Suitable For Single Phase Half Controlled Convertor.
6. Simulation On the Single Phase Ac-Dc Uncontrolled Convertor with & without the source Inductance.
7. Simulation Of A Single Phase Ac To Controlled Dc Convertor with & without the source Inductance.
8. Single Phase Half Controlled Bridge Convertor With Two Thyristors & Two Diodes.
9. Single Phase Fully Controlled Bridge Convertor Using Four Thyristors.
10. Pspice or MATH LAB Simulation Of Dc to Dc Step Down Chopper.
11. Pspice or MATH LAB Simulation Of Single Phase Controller with R-L Load.
12. Pspice or MATH LAB Simulation Of PWM Bridge Invertor Of R-L Load Using MOSFET.

17153H61P- UTILIZATION OF ELECTRICAL ENERGY

3 1 0 4
Semester VI

AIM
To plan and design using basic principles and handbooks
To select equipment, processes and components in different situations.

OBJECTIVES
i. To ensure that the knowledge acquired is applied in various fields as per his job requirements.
ii. To orient the subject matter in the proper direction, visits to industrial establishments are recommended in order to familiarize with the new developments in different areas.

UNIT I ELECTRIC LIGHTING 12
Production of light – Definition of terms – Lighting calculations – Types of lamps – Interior and Exterior illumination systems – Lighting schemes – Design of Lighting schemes – Factory lighting – Flood lighting – Energy saving measures.

UNIT II ELECTRIC HEATING 12
Resistance heating – Induction heating – Dielectric heating – Arc furnace – Control equipment, efficiency, and losses – Energy conservation in Arc Furnace Industry.

UNIT III ELECTRIC WELDING 12
Welding equipment – Characteristics of carbon and metallic arc welding – Butt welding – Spot welding – Energy conservation in welding.

UNIT IV ELECTRIC VEHICLE 12
Traction: System of track electrification, train movement and energy consumption (speed time curves, crest speed, average speed and schedule speed) rective effort, factors affecting energy consumption (dead weight, acceleration weight and adhesion weight) starting and braking of traction motors, protective devices

UNIT V ELECTRO CHEMICAL PROCESS 12
Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, efficiency – Batteries – Types – Charging methods.

Total = 60

Text Books:

1. Tripathy,S.C., “Electric Energy Utilization & Conservation” – Tata McGraw Hill Publishing Company.
2. Uppal,S.L., “Electric Power”, Khanna Publishers.
3. Soni,M.L., P.V.Gupta & Bhatnagar , “A course in Electric Power”, Dhanpat Rai & Sons.

Reference Books:

1. Partab,H., “Art & Science Utilization of Electrical Energy” – Dhanpat Rai & Sons.
2. Wadhwa,C.L., “Generation, Utilization & Distribution” - Wilsey Eastern Ltd.
3. Wadha C L - Utilization of Electric Power; New Age International
4. Suryanarayana . N.V., “Utilization of Electric Power” - Wilsey Eastern Ltd.

17153H62P SOLID STATE RELAYS **4 0 0 4**

Semester VI

UNIT 1 **9**

Advantages of Static Relays – Generalized Characteristics and Operational Equations of Relays – Steady State and Transient Performance of Signal Driving Elements – Signal Mixing Techniques and Measuring Techniques – CT's and PT's in Relaying Schemes – Saturation Effects.

UNIT 2 **9**

Static Relay Circuits (Using Analog and Digital IC's) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.

UNIT 3 **9**

Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.

UNIT 4 **9**

Static Relay Circuits for Carrier Current Protection – Steady State and Transient Behavior of Static Relays – Testing and Maintenance – Tripping Circuits using Thyristor.

UNIT 5 **9**

Microprocessor Based Relays – Hardware and Software for the Measurement of Voltage, Current, Frequency, Phase Angle – Microprocessor Implementation of Over Current Relays – Inverse Time Characteristics – Impedance Relay – Directional Relay – MHO Relay.

Total=45

Text Books:

1. Badriram and Vishwakarma D.N., Power System Protection and Switchgear, Tata McGraw Hill, New Delhi, 1995.
2. Rao T.S.M., Power System Protection – Static Relays, McGraw Hill, 1979.

Reference Books:

1. Van C.Warrington, "Protection Relays – Their Theory and Practice", Chapman and Hall.
2. Ravindranath B. and Chander M., "Power System Protection and Switchgear", Wiley Eastern, 1992.
3. Russel C.Mason, "The Art and Science of Protective relays".

17153H63P- POWER SYSTEM OPERATION AND CONTROL

4 0 0 4

Semester VI

AIM

To become familiar with the preparatory work necessary for meeting the next day's operation and the various control actions to be implemented on the system to meet the minute-to-minute variation of system load.

OBJECTIVES

i. To get an overview of system operation and control.
ii. To understand & model power-frequency dynamics and to design power-frequency controller.
iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNIT I INTRODUCTION 12

System load variation: System load characteristics, load curves - daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor Control, LFC, EDC, AVR, system voltage control, security control.

UNIT II REAL POWER - FREQUENCY CONTROL 12

Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC of single & Multi areas - Static & Dynamic Analysis of uncontrolled and controlled cases –Tie line with frequency bias control – Steady state instabilities.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 12

Typical excitation system, modeling, static and dynamic analysis, stability compensation; generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; method of voltage control: Injection of reactive power. Tap-changing transformer, numerical problems - System level control using generator voltage magnitude setting, tap setting of OLTC transformer.

UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH 12

Statement of Unit Commitment (UC) problem; constraints in UC: spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach, numerical problems only in priority-list method using full-load average production cost.
Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and λ-iteration method. (No derivation of loss coefficients.) Base point and participation factors.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 12

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in extremis and restorative. State transition diagram showing various state transitions and control strategies. **Total = 60**

TEXT BOOKS

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing
Company Ltd, New Delhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons,
Inc., 2003.
3. P. Kundur, 'Power System Stability & Control', McGraw Hill Publications, USA, 1994.

REFERENCE BOOKS

1. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill
Publishing Company Limited, New Delhi, 2003.
2. L.L. Grigsby, 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.

17153L65P POWER SYSTEMS LAB

0 0 3 2
Semester VI

AIM
To simulate analysis and planning cases for a practical power system.
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List Of Experiments:

1. Formation of Y-Bus Matrix by Inspection and Singular transformation methods.
2. Load flow solution using Gauss Seidal method
3. Load flow solution using Newton-Raphson method
4. Load flow solution by Fast Decoupled method
5. Symmetrical short circuit analysis
6. Unsymmetrical Fault analysis
7. Solution of swing Equation using modified Euler method
8. Power Electronic Circuits, design and simulation using Pspice
9. Simulation of Electrical drives using MATLAB, PSCAD
10. Control system design using MATLAB

P = 45

Total = 45

17160S71P TOTAL QUALITY MANAGEMENT 3 0 0 3

UNIT – I: BASICS OF TQM 9

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT – II: PRINCIPLES OF TQM 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDSA Cycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, Performance Measure.

UNIT – III: QUALITY CONCEPTS 9

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Concept of six sigma,

UNIT – IV: TQM TOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages of FMEA.

UNIT – V: ISO STANDARDS 9

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, ISO 14000 – Concept, Requirements and Benefits.

TOTAL : 45

TEXT BOOKS:

1. Dale H. Besterfiled, et al., “Total Quality Management”, Pearson Education, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker, “ TOTAL QUALITY MANAGEMENT”, Anuradha Agencies.

REFERENCES:

1. Feigenbaum.A.V. “Total Quality Management”, McGraw Hill, 1991.
2. Oakland.J.S. “Total Quality Management”, Butterworth – Hcinemann Ltd., Oxford. 1989.
3. Narayana V. and Sreenivasan, N.S. “Quality Management – Concepts and Tasks”, New Age International 1996

17153H72P- ELECTRICAL MACHINE DESIGN 3 1 0 4

Semester VII

AIM

To expose the students to the construction, principle of operation and performance of special electrical machines as an extension to the study of basic electrical machines.

OBJECTIVES

To impart knowledge on

i. Construction, principle of operation and performance of DC machine.

ii. Construction, operating Characteristics of single and three phase transformer.

iii. Design and operating characteristics of Induction motors.

iv Construction, principle of operation, Design of synchronous machines and to have knowledge of machine design in CAD

UNIT I INTRODUCTION 12

Major considerations – Limitations – Electrical Engineering Materials – Space factor – temperature gradient – Heat flow in two dimensions – thermal resistivity of winding – Temperature gradient in conductors placed in slots – Rating of machines – Eddy current losses in conductors – Standard specifications

UNIT II DC MACHINES 12

Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes – losses and efficiency calculations.

UNIT III TRANSFORMERS 12

KVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise of Transformers – Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers.

UNIT IV INDUCTION MOTORS 12

Magnetic leakage calculations – Leakage reactance of polyphase machines- Magnetizing current – Output equation of Induction motor – Main dimensions –Length of air gap- Rules for selecting rotor slots of squirrel cage machines – Design of rotor bars & slots – Design of end rings – Design of wound rotor-Operating characteristics –Short circuit current – circle diagram – Dispersion co-efficient – relation between D & L for best power factor.

UNIT V SYNCHRONOUS MACHINES 12

Runaway speed – construction – output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field m.m.f – Design of field winding – Design of turbo alternators – Rotor design - Introduction to computer aided design – Program to design main dimensions of Alternators.

Total = 60

REFERENCE BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

17153H73P- POWER PLANT ENGINEERING

4 0 0 4
Semester VII

UNIT I -THERMAL POWER PLANTS 9

Basic thermodynamic cycles – Various components of steam power plant – Layout – Pulverized coal burners – Fluidized bed combustion – Coal handling systems – Ash handling systems – Forced draft and induced draft fans – Boilers – Feed pumps – Super heater – Regenerator – Condenser – Dearearators – Cooling tower

UNIT II - HYDRO ELECTRIC POWER PLANTS 9

Layout – Dams – Selection of water turbines – Types – Pumped storage hydel plants

UNIT III - NUCLEAR POWER PLANTS 9

Principles of nuclear energy – Fission reactions – Nuclear reactor – Nuclear power plants

UNIT IV- GAS AND DIESEL POWER PLANTS 9

Types – Open and closed cycle gas turbine – Work output and thermal efficiency – Methods to improve performance – Reheating, intercoolings, regeneration – Advantage and disadvantages – Diesel engine power plant – Component and layout

UNIT V- NON – CONVENTIONAL POWER GENERATION 9

Solar energy collectors – OTEC – Wind power plants – Tidal power plants and geothermal resources – Fuel cell – MHD power generation – Principle – hermoelectric power generation – Thermionic power generation.

L: 45 T: 15 Total: 60

TEXT BOOKS

1. Arora and Domkundwar, "A Course in Power Plant Engineering", Dhanpat Rai.
2. Nag, P.K., "Power Plant Engineering", 2nd Edition, Tata McGraw Hill, 2003.

REFERENCES

1. Bernhardt, G.A., Skrotzki and William A. Vopat, "Power Station Engineering and Economy", 20th Reprint, Tata McGraw Hill, 2002.
2. Rai, G.D., "An Introduction to Power Plant Technology", Khanna Publishers.
3. El-Wakil, M.M., "Power Plant Technology", Tata McGraw Hill, 198

ELECTIVE-I

17153E44AP-FIELD THEORY

3 1 0 4
Semester-IV

AIM
To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering**.**

OBJECTIVES: To impart knowledge on
i. Concepts of electrostatics, electrical potential, energy density and their applications.
ii. Concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
iii. Faraday's laws, induced emf and their applications.
iv. Concepts of electromagnetic waves and Pointing vector.

UNIT I: **INTRODUCTION** **12**

Introduction-Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Electric flux density-Gauss's law and application – Electrical potential –potential gradient– Divergence & Divergence theorem- Poisson's and Laplace's equations

UNIT II: **STATIC ELECTRI FIELD** **12**

Field due to dipoles- dipole moment-current & current density-conductors and dielectric –boundary conditions– Capacitance-Dielectric Dielectric interface- capacitance of a system of conductors- Dielectric constant and dielectric strength- Energy stored in a capacitor- Energy density.

UNIT III: MAGNETOSTATICS **12**

Introduction- Biot–savart Law- Ampere's Circuital Law-Curl- Stoke's theorem-Magnetic flux- – Magnetic flux density (B)- Scalar and vector potential – Force on a moving charge and current elements- force & Torque on closed circuits.

UNIT IV: ELECTROMAGNETIC INDUCTION **12**

Introduction to magnetic materials – Magnetization and permeability- Magnetic Boundary conditions- Magnetic circuits-Potential energy and forces on magnetic materials.- Faraday's laws- Inductance & mutual inductance- Inductance of solenoid, toroid and transmission lines.

UNIT V: ELECTROMAGNETICS **12**
Conduction current and - Displacement current-, Maxwell's equations (differential and integral forms) -Wave propagation in free space, lossy and lossless dielectrics- Power and Poynting vector – Propagation in good conductors- wave polarization.

TOTAL = 60

TEXT BOOKS

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition, 1991.
2. William .H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.

REFERENCE BOOKS

1. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.
2. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 1997.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
4. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 1995.

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ELECTIVE-I

17152E44BP - FUZZY LOGIC AND ITS APPLICATIONS

3 1 0 4

Semester-IV

UNIT I -FUZZY LOGIC 7

Fuzzy sets – Fuzzy operation – Fuzzy arithmetic – Fuzzy relational equations – Fuzzy measure – Fuzzy functions – approximate reasoning – Fuzzy proposition – Fuzzy quantifiers-if-then rules.

UNIT II- FUZZY LOGIC IN CONTROL 8

Structure of Fuzzy logic controller – Fuzzification models – database – rule base – inference engine – defuzzification modules – Non-Linear fuzzy control – PID like FLC – Sliding mode FLC – Sugeno FLC – adaptive fuzzy control applications – case studies.

UNIT III- NEURAL NETWORKS IN CONTROL 8

Neural Network for Non-Linear systems – schemes of Neuro control-system identification forward model and inverse model – indirect learning neural network control applications – Case studies.

UNIT IV- MODELING AND CONTROL OF FACTS DEVICES NEURAL AND FUZZY TECHNIQUE 10

FACTS-concept and general system considerations, types of FACTS devices – special purpose FACTS devices, generalized and multifunctional FACTS devices – General comments on transient stability programs.Neuro – Fuzzy based FACTS controller for improvement of Transient stability systems – GA for Adaptive fuzzy system – case study.

UNIT V- STABILITY STUDIES UNDER MULTIPLE FACTS ENVIRONMENT 12

Introduction to small signal analysis – simulation and modeling of FACTS controllers for small signal analysis. Comparison between dynamic and transient stability results. Introduction to EMTP – (Electromagnetic Transient programme / Package), Modeling of FACTS controllers for power system studies using EMTP.

TOTAL=45

REFERENCES:

1. KOSKO. B. “Neural Networks and Fuzzy systems”, Prentice-Hall of India Pvt.Ltd., 1994.
2. Driankov, Hellendroon, “Introduction to Fuzzy control” Narosa Publisher.
3. Ronald R.Yager and Dimitar P.Filev “Essential of fuzzy modeling and control “ John Wiley & Sons, Inc.
4. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho” FACTS – Modeling and simulation in Power Networks” John Wiley & Sons.
5. Kundur P., “Power system stability and control”, McGraw Hill, 1994.

17153E44CP - BIOMEDICAL INSTRUMENTATION

4 0 0 4
Semester-IV

AIM

The course is designed to make the student acquire an adequate knowledge of the physiological systems of the human body and relate them to the parameters that have clinical importance. The fundamental principles of equipment that are actually in use at the present day are introduced.

OBJECTIVES

i. To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.
ii. To introduce the student to the various sensing and measurement devices of electrical origin.
iii. To provide the latest ideas on devices of non-electrical devices.
iv. To bring out the important and modern methods of imaging techniques.
v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I BASIC PHYSIOLOGY 9

Cells and their structures – Transport of ions through cell membrane – Resting and excited state – Tran membrane potential – Action potential – Bio-electric potential – Nervous system – Physiology of muscles – Heart and blood circulation – Respiratory system – Urinary system.

UNIT II BASIC TRANSDUCER PRINCIPLES AND ELECTRODES 9

Transducer principles - Active transducers - Passive transducers -Transducer for Bio-medical application -Electrode theory- Bio-potential electrode - Bio - chemical transducer.

UNIT III CARDIOVASCULAR SYSTEM 9

The heart and cardiovascular system – Blood pressure – Characteristics of blood flow – Heart sounds - Electro cardiography – Measurements of blood pressure – Measurement of blood flow and cardiac O/P Plethysmography – Measurements of heart sounds.

UNIT IV X-RAY AND RADIOISOTOPE INSTRUMENTATION 9

X-ray imaging radiography – Fluoroscopy – Image intensifiers – Angiography - Medical use of radioisotopes – Beta radiations – Detectors – Radiation therapy.

UNIT V BIO-TELEMETRY 9

Introduction to biotelemetry – Physiological parameters adaptable to biotelemetry – the components of biotelemetry systems – Implantable units – Applications of telemetry in patient care – Application of computer in Bio-medical instrumentation, Anatomy of Nervous system – Measurement from the nervous system – EEG – EMG.

Total = 45

REFERENCE BOOKS:

1. Lesis Cromwell Fred, J.Werbell and Erich A.Pfraffer, Biomedical instrumentation and Measurements – Prentice Hall of India, 1990.
2. M.Arumugam, Bio-medical Instrumentation – Anuradha Agencies Publishers, 1992.
3. Khandpur, Handbook on Biomedical Instrumentation – Tata McGraw Hill Co Ltd., 1989.

ELECTIVE-I
Semester-IV

17153E44DP - MODELING AND SIMULATION OF SOLAR ENERGY SYSTEMS

4 0 0 4

UNIT I: SOLAR RADIATION AND COLLECTORS 9

Solar angles - day length, angle of incidence on tilted surface - Sunpath diagrams - shadow determination - extraterrestrial characteristics - measurement and estimation on horizontal and tilted surfaces - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors – classification - design and performance parameters - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors.

UNIT I: APPLICATIONS OF SOLAR THERMAL TECHNOLOGY 9

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying.

UNIT III: SOLAR PV FUNDAMENTALS 9

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - figure of merits of solar cell – efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells - preparation of metallurgical, electronic and solar grade Silicon - production of single crystal Silicon: Czokralski (CZ) and Float Zone (FZ) method - Design of a complete silicon – GaAs- InP solar cell - high efficiency III-V, II-VI multi junction solar cell; a-Si-H based solar cells-quantum well solar cell -thermophotovoltaics.

UNIT IV: SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS 9

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization - detailed array design - storage autonomy - voltage regulation - maximum tracking – use of computers in array design - quick sizing method - array protection and trouble shooting - centralized and decentralized SPV systems - stand alone - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems.

UNIT V: SOLAR PASSIVE ARCHITECTURE 9

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces -

passive cooling concepts: evaporative cooling - radiative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design - thermal comfort – concept of solar temperature and its significance - calculation of instantaneous heat gain through building envelope.

TOTAL: 45

TEXT BOOKS:

1. Sukhatme S P, Solar Energy, Tata McGraw Hill, 1984.
2. Kreider, J.F. and Frank Kreith, Solar Energy Handbook, McGraw Hill, 1981.
3. Goswami, D.Y., Kreider, J. F. and & Francis., Principles of Solar Engineering, 2000.

REFERENCES:

1. Garg H P., Prakash J., Solar Energy: Fundamentals & Applications, Tata BMcGraw Hill, 2000.
2. Duffie, J. A. and Beckman, W. A., Solar Engineering of Thermal Processes, John Wiley, 1991.
3. Alan L Fahrenbruch and Richard H Bube, Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press, 1983.
4. Larry D Partain, Solar Cells and their Applications, John Wiley and Sons, Inc, 1995.
5. Roger Messenger and Jerry Vnetre, Photovoltaic Systems Engineering, CRC Press, 2004.
6. Sodha, M.S, Bansal, N.K., Bansal, P.K., Kumar, A. and Malik, M.A.S. Solar Passive Building, Science and Design, Pergamon Press, 1986.
7. Krieder, J and Rabi, A., Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.

17158E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNIT I- INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineral resources: use and effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT II-ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem. Introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III -ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards — role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV-SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. environment production act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

UNIT V-HUMAN POPULATION AND THE ENVIRONMENT 6

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

TOTAL : 45

TEXT BOOKS

1. Gilbert M .Masters, "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., "Environmental Science", Wadsworth Publishing Co.

REFERENCES

1. Bharucha Erach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad India.
2. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, "Essentials of Ecology, Blackwell Science.
6. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications.

ELECTIVE-II
Semester-v

17152E54BP -ARTIFICIAL NEURAL NETWORKS

4 0 0 4

UNIT I : INTRODUCTION TO ARTIFICIAL NEURAL NETWORKS 12
Biological neural networks - Pattern analysis tasks: Classification, Regression, Clustering - Computational models of neurons - Structures of neural networks - Learning principles

UNIT II: LINEAR MODELS FOR REGRESSION AND CLASSIFICATION 12
Polynomial curve fitting - Bayesian curve fitting - Linear basis function models - Bias-variance decomposition - Bayesian linear regression - Least squares for classification - Logistic regression for classification- Bayesian logistic regression for classification

UNIT III: FEEDFORWARD NEURAL NETWORKS 12
Pattern classification using preceptor - Multilayer feed forward neural networks (MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back propagation learning - Fast learning methods: Conjugate gradient method – Auto associative neural networks - Bayesian neural networks

UNIT III: RADIAL BASIS FUNCTION NETWORKS 12
Regularization theory - RBF networks for function approximation - RBF networks for pattern classification

UNIT IV: KERNEL METHODS FOR PATTERN ANALYSIS 12
Statistical learning theory- Support vector machines for pattern classification- Support vector regression for function approximation- Relevance vector machines for classification and regression

UNIT V: SELF-ORGANIZING MAPS 12
Pattern clustering- Topological mapping- Kohonen’s self-organizing map

FEEDBACK NEURAL NETWORKS

Pattern storage and retrieval- Hopfield model- Boltzmann machine- Recurrent neural networks

TOTAL=60

Text Books:

1. B.Yegnanarayana, Artificial Neural Networks, Prentice Hall of India, 1999

2. Satish Kumar, Neural Networks – A Classroom Approach, Tata McGraw-Hill, 2003
3. S.Haykin, Neural Networks – A Comprehensive Foundation, Prentice Hall, 1998
4. C.M.Bishop, Pattern Recognition and Machine Learning, Springer, 2006

ELECTIVE-II
Semester-v

17152E54CP -COMMUNICATION ENGINEERING 3 1 0 4

UNIT I **9**

Need for Modulation, Amplitude Modulation, AM Demodulator, SSB Modulation, Vestigial Sideband Modulation, AM transmitter and Receiver, Noise and bandwidth in AM, Carrier Communication, Basic Principles of Pulsed and CW Radar.

UNIT II **9**

Frequency Modulation, FM Demodulator, Phase Modulation, FM transmitter and receiver, Noise and bandwidth in FM, Ground wave, sky wave and space wave propagation, Basic Principles of BW and Colour TV.

UNIT III **9**

Sampling theorem, PAM, PWM, PPM, Pulse Code Modulation, Noise in PCM, Delta Modulation, Adaptive Delta modulation, DPCM, M'ary system, FDM and TDM.

UNIT IV **9**

Digital Modulation, ASK, FSK, PSK, DPSK, Basic Principles of Optical Communication, Satellite Comm., Mobile Comm.

UNIT V **9**

Entropy, Mutual Information, Channel Capacity, Shannon Theorem, Shannon-Hartley Theorem, Shannon-Fano code, Huffman code, Parity Check Code, Hamming's Single Error Correction Code.

TOTAL 45

REFERENCE BOOKS:

1. Electronics Communication System - G.Kennedy
2. Communication System-Analog & Digital - R.P.Singh & S.D.Sapre

ELECTIVE-II
Semester-v

17154E54DP - ROBOTICS

3 1 0 4

UNIT I: INTRODUCTION **9**

Robot ,its evaluation; definition and aes of robotics, present application status.

UNIT II: ROBOT ANATOMY **9**

configuration, robot motions, work volume. Robot drives, actuators and control; Functions and types of drives and actuators; concept of basic control systems, open loop, close loop, different type of controllers, ON-OFF, proportional, integral, PI, PD, PID.

UNIT III: ROBOT END EFFECTORS: **9**

Types of end effecters, mechanical gripper, tools and end effectors. Robot sensors: Transducers and sensors; analog and digital transducers; types of sensors, tachfile sensors, proximity and rough sensors ; miscellaneous sensors; vision systems; use of sensors in robotics.

UIT IV: ROBOT KINEMATICS **9**

Position representations; forward and reverse kinematics of three and four degrees of freedom; robot arm; homogeneous transformations and robot kinematics; kinematics equations using homogeneous transformation .

UNIT V: INDUSTRIAL APPLICATION **9**

Capabilities of robots; robot applications; materials handling; pick and place operation; palletiging and depalletiging; machine loading and unloading; machine casting; welding;painting,assembly; inspection; maintenance.

BOOKS RECOMMENDED:

1.Schilling-Fundamental of robotics; PH
2.Yoshikawa- Fundamental of robotics; PH
3. S.R.Deb-Robotics Technology and Flexible Automation
4. Introduction to Robotics, John J Craig; Pearson Education

ELECTIVE III
Semester VI

17160E64AP - PRINCIPLES OF MANAGEMENT 4 0 0 4

OBJECTIVE

i. To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.
ii. To understand the statistical approach for quality control.
iii. To create an awareness about the ISO and QS certification process and its need for the industries

UNIT I HISTORICAL DEVELOPMENT 12

Definition of Management – Science or Art – Management and Administration – Development of Management Thought – Contribution of Taylor and Fayol – Functions of Management – Types of Business Organisation.

UNIT II PLANNING 12

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNIT III ORGANISING 12

Nature and Purpose – Formal and informal organization – Organization Chart – Structure and Process – Departmentation by difference strategies – Line and Staff authority – Benefits and Limitations – De-Centralization and Delegation of Authority – Staffing – Selection Process - Techniques – HRD – Managerial Effectiveness.

UNIT IV DIRECTING 12

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs – Motivation theories – Motivational Techniques –Job Enrichment – Communication – Process of Communication – Barriers and Breakdown –Effective Communication – Electronic media in Communication.

UNIT V CONTROLLING 12

System and process of Controlling – Requirements for effective control – The Budget as Control Technique – Information Technology in Controlling – Use of computers in handling the information – Productivity – Problems and Management – Control of Overall Performance – Direct and Preventive Control – Reporting – The Global Environment – Globalization and Liberalization – International Management and Global theory of Management.

TOTAL = 60

TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich "Essentials of Management", Tata Mcgraw Hill,1998.
2. Joseph L Massie "Essentials of Management", Prentice Hall of India, (Pearson) Fourth Edition, 2003.

REFERENCE BOOKS

1. Tripathy PC And Reddy PN, " Principles of Management", Tata Mcgraw Hill,1999.
2. Decenzo David, Robbin Stephen A, "Personnel and Human Reasons Management", Prentice Hall of India, 1996.
3. JAF Stomer, Freeman R. E and Daniel R Gilbert Management, Pearson Education, Sixth Edition, 2004.

4. Fraidoon Mazda, " Engineering Management", Addison Wesley,-2000.

ELECTIVES-III
Semester VI

17160E64BP - PROFESSIONAL ETHICS 4 0 0 4

AIM :
To ensure that the required technical knowledge and skills can be learnt .

OBJECTIVES :
i. To create an awareness on Engineering Ethics and Human Values.
ii. To instill Moral and Social Values and Loyalty
iii. To appreciate the rights of Others

UNIT I HUMAN VALUES 9
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

UNIT II ENGINEERING ETHICS 9
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the three mile island and chernobyl case studies.
Collegiality and loyalty - respect for authority - collective bargaining - confidentiality - conflicts of interest - occupational crime - professional rights - employee rights - Intellectual Property Rights (IPR) - discrimination.

UNIT V GLOBAL ISSUES 9
Multinational corporations - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline).

Total = 45

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “ Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS

1. Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
2. Charles E Harris, Michael S. Protchard and Michael J Rabins, “ Engineering Ethics – Concepts and Cases”, Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, “ Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003.
4. Edmund G Seebauer and Robert L Barry, “ Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001 .

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ELECTIVES-III
SEMESTER-VI

17152E64CP INTEGRATED OPTO-ELECTRONIC DEVICES 3 1 0 4

AIM

To learn different types of optical emission, detection, modulation and opto electronic integrated circuits and their applications.

OBJECTIVE

• To know the basics of solid state physics and understand the nature and characteristics of light.
• To understand different methods of luminescence, display devices and laser types and their applications.
• To understand different light modulation techniques and the concepts and applications of optical switching.

UNIT I: ELEMENTS OF LIGHT AND SOLID STATE PHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of Quantum Mechanical concept, Review of Solid State Physics, Review of Semiconductor Physics and Semiconductor Junction Device.

UNIT II: DISPLAY DEVICES AND LASERS 9

Introduction, Photo Luminescence, Cathode Luminescence, Electro Luminescence, Injection Luminescence, Injection Luminescence, LED, Plasma Display, Liquid Crystal Displays, Numeric Displays, Laser Emission, Absorption, Radiation, Population Inversion, Optical Feedback, Threshold condition, Laser Modes, Classes of Lasers, Mode Locking,laserapplications.

UNIT III: OPTICAL DETECTION DEVICES 9

Photo detector, Thermal detector, Photo Devices, Photo Conductors, Photo diodes, Detector Performance.

UNIT IV OPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices, Acoustoptic devices, Optical, Switching and Logic Devices.

UNIT V OPTOELECTRONIC INTEGRATED CIRCUITS 9

Introduction, hybrid and Monolithic Integration, Application of Opto Electronic Integrated circuits, integrated transmitters and Receivers, Guided wave devices.

TEXTBOOK

1. J. Wilson and J.Haukes, "Opto Electronics – An Introduction", Prentice Hall of India Pvt. Ltd.,NewDelhi,1995.

REFERENCES

1. Bhattacharya "Semiconductor Opto Electronic Devices", Prentice Hall of India Pvt., Ltd., NewDelhi,1995.
2. Jasprit Singh, "Opto Electronics – As Introduction to materials and devices", McGraw-Hill International Edition, 1998.

ELECTIVES-III
SEMESTER-VI

17153E64DP -COMPUTER AIDED DESIGN FOR ELECTRICAL APPARATUS

3 1 0 4

AIM

To introduce the basics of Computer Aided Design technology for the design of Electrical
Machines.

OBJECTIVE

At the end of this course the student will be able to

- Learn the importance of computer aided design method.
- Understand the basic electromagnetic field equations and the problem formulation for CAD applications.
- Become familiar with Finite Element Method as applicable for Electrical Engineering.
- Know the organization of a typical CAD package.
- Apply Finite Element Method for the design of different Electrical apparatus.

UNIT I: INTRODUCTION 12

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNIT II: MATHEMATICAL FORMULATION OF FIELD PROBLEMS 12

Electromagnetic Field Equations – Magnetic Vector/Scalar potential – Electrical vector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNIT III: PHILOSOPHY OF FEM **12**

Mathematical models – Differential/Integral equations – Finite Difference method – Finite element method – Energy minimization – Variation method- 2D field problems – Discretisation – Shape functions – Stiffness matrix – Solution techniques.

UNIT IV: CAD PACKAGES **12**

Elements of a CAD System –Pre-processing – Modeling – Meshing – Material properties- Boundary Conditions – Setting up solution – Post processing.

UNIT V: DESIGN APPLICATIONS **12**

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

TEXT BOOKS

1. S.J Salon, 'Finite Element Analysis of Electrical Machines', Kluwer Academic Publishers, London, 1995.
2. Nicola Bianchi, 'Electrical Machine Analysis using Finite Elements', CRC Taylor& Francis, 2005.

REFERENCES

1. Joao Pedro, A. Bastos and Nelson Sadowski, 'Electromagnetic Modeling by Finite Element Methods', Marcell Dekker Inc., 2003.
2. P.P.Silvester and Ferrari, 'Finite Elements for Electrical Engineers', Cambridge University Press, 1983.
3. D.A.Lowther and P.P Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, New York, 1986.
4. S.R.H.Hoole, 'Computer Aided Analysis and Design of Electromagnetic Devices', Elsevier, New York, 1989.
5. User Manuals of MAGNET, MAXWELL & ANSYS Softwares.

ELECTIVES-IV
SEMESTER-VII

17153E74AP- POWER SYSTEM TRANSIENTS

3 0 0 3
Semester VII

AIM
To understand generation of switching and lighting transients, their propagation, reflection and refraction a on the grid ad their impact on the grid equipment.

OBJECTIVES
i. To study the generation of switching transients and their control using circuit – theoretical concept.
ii. To study the mechanism of lighting strokes and the production of lighting surges.
iii. To study the propagation, reflection and refraction of travelling waves.
iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 7
Various types of power system transients - effects of transients on power systems.

UNIT II LIGHTNING AND SWITCHING SURGES 17
Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNIT III MODELLING OF POWER SYSTEM EQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNIT IV COMPUTATION OF TRANSIENT OVERVOLTAGES 14
Computation of transients – traveling wave method, Bewley's lattice diagram – analysis in time and frequency domain, EMTP for transient computation.

UNIT V INSULATION COORDINATION 12
Insulation co-ordination – over voltage protective devises principles of recent co-ordination and design of EHV lines. **Total = 60**

TEXT BOOKS

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter science, New York, 2nd edition 1991**.**
2. R.D Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCES

1. Klaus Ragaller, 'Surges in High Voltage Networks', Plenum Press, New York, 1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

ELECTIVES-IV
SEMESTER-VII

17153E74BP -EHV AC and DC TRANSMISSION SYSTEMS

3 0 0 3

UNIT I TRANSMISSION ENGINEERING 9
Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.

UNIT II LINE PARAMETER 9
Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.

UNIT III POWER CONTROL 9
Power frequency and voltage control – voltage control – Over voltages – Power circle diagram – Voltage control using shunt and series compensation – Static VAR compensation – Higher Phase order system – FACTs.

UNIT IV EHV AC Transmission 9
Design of EHV lines based in steady state limits and transient over voltages – Design of extra HV cable transmission – XLPE cables – Gas insulated cable – Corona and RIV.

UNIT V HVDC TRANSMISSION 9

HVDC Transmission principles – Comparison of HVAC and HVDC transmission – Economics – types of Converters – HVDC links – HVDC control – Harmonics – Filters – Multi terminal DC System – HVDC cables and HVDC circuit breakers.

Total=45

Reference Books:

1. Rakosh Das Begamudre, ‘Extra HVDC Transmission Engineering’, Wiley Eastern Ltd, 1990.
2. Padiyar K.R., ‘HVDC Power Transmission systems’, Wiley Eastern Ltd, 1993.
3. Allan Greenwood, ‘Electrical transients in power Systems’, John Eastern Ltd, New York, 1992.
4. Arrilaga J., ‘HVDC transmission’, Peter Perengrinus Ltd, London, 1983.

ELECTIVES-IV
SEMESTER-VII

17153E74CP-FIBRE OPTICS AND LASER INSTRUMENTS 3 0 0 3

AIM:

To contribute to the knowledge of Fibre optics and Laser Instrumentation and its Industrial & Medical Application.

OBJECTIVES

i. To expose the students to the basic concepts of optical fibres and their properties.
ii. To provide adequate knowledge about the Industrial applications of optical fibres.
iii. To expose the students to the Laser fundamentals.
iv. To provide adequate knowledge about Industrial application of lasers.
v. To provide adequate knowledge about holography & Medical applications of Lasers.

1. OPTICAL FIBRES AND THEIR PROPERTIES 12

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors & splicers – Fibre termination – Optical sources – Optical detectors.

2. INDUSTRIAL APPLICATION OF OPTICAL FIBRES

9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

3. LASER FUNDAMENTALS **9**

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

4. INDUSTRIAL APPLICATION OF LASERS **6**

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

5. HOLOGRAM AND MEDICAL APPLICATIONS **9**

Holography – Basic principle - Methods – Helographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumours of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

L= 45 Total = 45

TEXT BOOKS

1. J.M. Senior, 'Optical Fibre Communication – Principles and Practice', Prentice Hall of India, 1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.

REFERENCE BOOKS

1. Donald J.Sterling Jr, 'Technicians Guide to Fibre Optics', 3rd Edition, Vikas Publishing House, 2000.
2. M. Arumugam, 'Optical Fibre Communication and Sensors', Anuradha Agencies, 2002.
3. John F. Read, 'Industrial Applications of Lasers', Academic Press, 1978.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968
5. G. Keiser, 'Optical Fibre Communication', McGraw Hill, 1995.
6. Mr. Gupta, 'Fiber Optics Communication', Prentice Hall of India, 2004.

17153E74DP- ADVANCED CONTROL SYSTEMS 3 0 0 3

AIM

To gain knowledge in analysis of non-linear system and digital control of linear system.

OBJECTIVES

- i. To study the description and stability of non-linear system.
- ii. To study the conventional technique of non-linear system analysis.
- iii. To study the analysis discrete time systems using conventional techniques.
- iv. To study the analysis of digital control system using state-space formulation.
- v. To study the formulation and analysis of multi input multi output (MIMO) system.

UNIT I NON-LINEAR SYSTEM – DESCRIPTION & STABILITY **9**

Linear vs non-linear – Examples – Incidental and Intentional – Mathematical description - Equilibria and linearisation - Stability – Lyapunov function – Construction of Lyapunov function.

UNIT II PHASE PLANE AND DESCRIBING FUNCTION ANALYSIS **9**

Construction of phase trajectory – Isocline method – Direct or numerical integration – Describing function definition – Computation of amplitude and frequency of oscillation.

UNIT III Z-TRANSFORM AND DIGITAL CONTROL SYSTEM **9**

Z transfer function – Block diagram – Signal flow graph – Discrete root locus – Bode plot.

UNIT IV STATE-SPACE DESIGN OF DIGITAL CONTROL SYSTEM **9**

State equation – Solutions – Realization – Controllability – Observability – Stability Jury's test.

UNIT V MUTLI INPUT MULTI OUTPUT (MIMO) SYSTEM: 9

Models of MIMO system – Matrix representation – Transfer function representation – Poles and Zeros – Decoupling – Introduction to multivariable Nyquist plot and singular values analysis – Model predictive control. **L = 45 Total = 45**

TEXT BOOKS

1. Benjamin C. Kuo, 'Digital Control Systems', Oxford University Press, 1992.
2. George J. Thaler, 'Automatic Control Systems', Jaico Publishers, 1993.

REFERENCE BOOKS

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Raymond T. Stefani & Co., 'Design of feed back Control systems', Oxford University, 2002.
3. William L. Luyben and Michael L. Luyben, 'Essentials of Process Control', McGraw Hill International Editions, Chemical Engineering Series, 1997.

PROGRAMME EDUCATIONAL OBJECTIVES:

PEO1:Toenable graduatestopursue research,or have a successful career inacademia or industries associated withElectronicsand Communication Engineering, or as entrepreneurs.

PEO2: To providestudentswithstrong foundationalconceptsandalsoadvanced techniquesand tools in order to enable them to build solutions orsystems of varyingcomplexity.

PEO3:Toprepare studentstocriticallyanalyzeexisting literatureinanareaofspecializationand ethically developinnovativeandresearchorientedmethodologiestosolvetheproblems identified.

PROGRAMME OUTCOMES:

EngineeringGraduates will be able to:

A. **Engineeringknowledge**:Applytheknowledgeofmathematics,science,engineering fundamentals,andanengineering specializationtothesolutionofcomplexengineering problems.

B. **Problem analysis**:Identify,formulate,reviewresearchliterature,andanalyzecomplex engineering problemsreaching substantiatedconclusionsusingfirstprinciplesof mathematics, natural sciences, and engineeringsciences.

C. **Design/developmentofsolutions**:Designsolutionsforcomplexengineeringproblems and design system components or processes that meet the specified needs with appropriate considerationfor the public healthandsafety,andthe cultural,societal,and environmental considerations.

D.**Conduct investigationsofcomplex problems**:Use research-basedknowledgeand researchmethodsincludingdesignofexperiments,analysisandinterpretationofdata, and synthesisof theinformation to provide valid conclusions.

E. **Moderntoolusage**:Create,select,andapplyappropriatetechniques,resources,and modernengineering andITtoolsincludingpredictionandmodeling tocomplex engineeringactivities with an understandingof thelimitations.

F. **Theengineerandsociety**:Apply reasoninginformedby thecontextualknowledgeto assess societal, health, safety,legalandculturalissues and the consequentresponsibilities relevant to the professional engineeringpractice.

G. **Environment andsustainability**:Understandthe impactof the professionalengineering solutionsinsocietaland environmentalcontexts,anddemonstratetheknowledgeof,and need forsustainable development.

H. **Ethics**:Applyethicalprinciplesandcommittoprofessionalethicsandresponsibilities and norms of the engineeringpractice.

I. **Individualandteamwork**:Functioneffectivelyasanindividual,andasamemberor leader in diverseteams,and in multidisciplinarysettings.

J. **Communication**:Communicateeffectivelyoncomplexengineeringactivitieswiththe engineeringcommunityandwithsociety atlarge,suchas,beingabletocomprehendand write effective reportsanddesigndocumentation,make effective presentations,andgive and receive clear instructions.

K. **Projectmanagementandfinance**:Demonstrateknowledgeandunderstandingofthe engineeringandmanagementprinciplesandapply thesetoone‘sownwork,asamember and leader in ateam, tomanageprojects and inmultidisciplinaryenvironments.

L. **Life-longlearning**:Recognizetheneedfor,andhavethepreparationandabilityto engageinindependentandlife-long learning inthebroadestcontext oftechnological change.

MAPPINGOF PROGRAMME EDUCATIONAL OBJECTIVESWITH PROGRAMME OUTCOMES

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

1-Reasonable: 2-Significant: 3-Strong

SEMESTERI

S.No	Course Code	CourseTitle	L	T	P	C
1	**17147S11**	CommunicativeEnglish	5	1	0	4
2	**17148S12**	EngineeringMathematics-I	5	1	0	4
3	**17149S13**	EngineeringPhysics	5	1	0	4
4	**17149S14**	EngineeringChemistry	5	1	0	4
5	**17154S15**	Engineering Graphics	5	1	0	4
6	**17150S16**	ProblemSolving and Python programming	5	1	0	4
7	**17150L17**	Problem Solving and Python Programming Laboratory	0	0	3	2
8	**17149L18**	Physics andChemistryLaboratory	0	0	3	2
9	**171VEA19**	Value Education				1
	TOTAL CREDITS					**29**

SEMESTER–II

S.No	CourseCode	CourseName	L	T	P	C
1	**17147S21**	Technical English	5	1	0	4
2	**17148S22A**	Engineering Mathematics -II	5	1	0	4
3	**17149S23B**	Physics forElectronics Engineering	5	1	0	4
4	**17149S24A**	Environmental Scienceand Engineering	5	1	0	4
5	**17153S25C**	Circuit Theory	5	1	0	4
6	**17154S26C**	BasicCivil andMechanicalEngineering	5	1	0	4
7	**17154L27**	EngineeringPracticesLaboratory	0	0	3	2
8	**17153L28C**	ElectricCircuitsLaboratory	0	0	3	2
9	**171ICA29**	Fundamentals ofIndianConstitution and Economy				1
	TOTAL CREDITS					**29**

SEMESTERIII

S.No	CourseCode	CourseName	L	T	P	C
1	**17149S31C**	TransformsandPartialDifferential Equations	3	1	0	4
2	**17153C32**	DigitalLogic Circuits	3	1	0	3
3	**17153C33**	ElectromagneticTheory	2	2	0	3
4	**17153C34**	ElectricalMachines-I	2	2	0	3
5	**17153C35**	Electron Devices and Circuits	3	0	0	3
6	**17153C36**	PowerPlantEngineering	3	0	0	3
7	**17153L37**	Electronics Laboratory	0	0	3	2
8	**17153L38**	ElectricalMachinesLaboratory-I	0	0	3	2
					TOTAL CREDITS	**23**

SEMESTERIV

S.No	CourseCode	CourseName	L	T	P	C
1	**17149C41C**	Numerical Methods	4	0	0	4
2	**17153C42**	Electrical Machines-II	2	2	0	3
3	**17153C43**	Transmission andDistribution	3	0	0	3
4	**17153C44**	MeasurementsandInstrumentation	3	0	0	3
5	**17153C45**	LinearIntegratedCircuits and Applications	3	0	0	3
6	**17153C46**	Control Systems	3	2	0	4
7	**17153L47**	Electrical MachinesLaboratory-II	0	0	4	2
8	**17153L48**	Linear andDigitalIntegrated Circuits Laboratory	0	0	4	2
9	**17153L49**	Technical Seminar	0	0	2	1
10	**17153CRS**	ResearchLed Seminar	0	0	0	1
					TOTAL CREDITS	**26**

SEMESTER-V

S.No	CourseCode	CourseName	L	T	P	C
1	**17153C51**	Power SystemAnalysis	3	0	0	3
2	**17153C52**	Microprocessors andMicrocontrollers	3	0	0	3
3	**17153C53**	Power Electronics	3	0	0	3
4	**17153FE54_**	FreeElective-I*	3	0	0	3
5	**17153C55**	Digital SignalProcessing	2	2	0	3
6	**17153C56**	Object Oriented Programming	3	0	0	3
7	**17153L57**	Control andInstrumentationLaboratory	0	0	3	2
8	**17153L58**	Object Oriented Programming Laboratory	0	0	3	2
9	**17153L59**	ProfessionalCommunication	0	0	2	1
10	**17153CRM**	Research Methodology	3	0	0	3
					TOTAL CREDITS	**26**

SEMESTER-VI

S.No	CourseCode	CourseName	L	T	P	C
1	**17153C61**	Solid StateDrives	3	0	0	3
2	**17153C62**	Protection and Switchgear	3	0	0	3
3	**17153C63**	Embedded Systems	3	0	0	3
4	**17153E64_**	Elective -I	3	0	0	3
5	**17153E65__**	Elective -II	3	0	0	3
6	**17153L66**	Power ElectronicsandDrivesLaboratory	0	0	3	2
7	**17153L67**	Microprocessors andMicrocontrollers Laboratory	0	0	3	2
8	**17153MP68**	Mini Project	0	0	4	2
9	**17153CBR**	Participation in BoundedResearch	0	0	0	2
					TOTAL CREDITS	**23**

SEMESTER–VII

S.No	CourseCode	CourseName	L	T	P	C
1	**17153C71**	High Voltage Engineering	3	0	0	3
2	**17153C72**	Power SystemOperationand Control	3	0	0	3
3	**17153C73**	Renewable EnergySystems	3	0	0	3
4	**17153FE74_**	FreeElective-II	3	0	0	3
5	**17153E75_**	Elective -III	3	0	0	3
6	**17153E76_**	Elective -IV	3	0	0	3
7	**17153L77**	Power System SimulationLaboratory	0	0	3	2
8	**17153L78**	Renewable EnergySystemsLaboratory	0	0	3	2
9	**17153CSR**	Participation in Scaffolded Research (Design / Socio Technical Project)	0	0	0	4
					TOTAL CREDITS	**26**

SEMESTER–VIII

S.No	CourseCode	CourseName	L	T	P	C
1.	**17153E81_**	Elective -V	3	0	0	3
2.	**17153E82_**	Elective -VI	3	0	0	3
3.	**17153P81**	Project Work	-	-	-	12
4.	**17153CEC**	Comprehensive ExitCourse				2
					TOTAL CREDITS	**20**

*Course from the curriculumof other UG Programmes

LISTOFELECTIVES

ELECTIVE –I(VISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1.	**17153E64A**	Advanced Control System	2	2	0	3
2.	**17153E64B**	VisualLanguagesandApplications	3	0	0	3
3.	**17153E64C**	Design of ElectricalApparatus	3	0	0	3
4.	**17153E64D**	Power Systems Stability	3	0	0	3
5.	**17153E64E**	Modern Power Converters	3	0	0	3
6.	**17153E64F**	Intellectual PropertyRights	3	0	0	3

ELECTIVE–II(VISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1.	**17153E65A**	Principles of Robotics	3	0	0	3
2.	**17153E65B**	Special Electrical Machines	3	0	0	3
3.	**17153E65C**	Power Quality	3	0	0	3
4.	**17153E65D**	EHVAC Transmission	3	0	0	3
5.	**17153E65E**	Communication Engineering	3	0	0	3

ELECTIVE –III(VIISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1	**17153E75A**	Disaster Management	3	0	0	3
2	**17153E75B**	Human Rights	3	0	0	3
3	**17153E75C**	Operations Research	3	0	0	3
4	**17153E75D**	Probabilityand Statistics	3	0	0	3
5	**17153E75E**	FiberOpticsandLaserInstrumentation	3	0	0	3

ELECTIVE –IV(VIISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1	**17153E76A**	SystemIdentification andAdaptiveControl	3	0	0	3
2	**17153E76B**	Computer Architecture	3	0	0	3
3	**17153E76C**	Control of Electrical Drives	3	0	0	3
4	**17153E76D**	VLSIDesign	3	0	0	3
5	**17153E76E**	Power Systems Transients	3	0	0	3
6	**17153E76F**	Total QualityManagement	3	0	0	3

ELECTIVE –V(VIIISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1	**17153E81A**	FlexibleAC TransmissionSystems	3	0	0	3
2	**17153E81B**	Soft ComputingTechniques	3	0	0	3
3	**17153E81C**	Power Systems Dynamics	3	0	0	3
4	**17153E81D**	SMPSand UPS	3	0	0	3
5	**17153E81E**	Electric EnergyGeneration,Utilization and Conservation	3	0	0	3
6	**17153E81F**	Professional Ethics inEngineering	3	0	0	3
7	**17153E81G**	PrinciplesofManagement	3	0	0	3

ELECTIVE –VI(VIIISEMESTER)

S.No	CourseCode	CourseName	L	T	P	C
1	**17153E82A**	EnergyManagement andAuditing	3	0	0	3
2	**17153E82B**	Data Structures	3	0	0	3
3	**17153E82C**	High VoltageDirect CurrentTransmission	3	0	0	3
4	**17153E82D**	MicrocontrollerBased SystemDesign	3	0	0	3
5	**17153E82E**	Smart Grid	3	0	0	3
6	**17153E82F**	BiomedicalInstrumentation	3	0	0	3
7	**17153E82G**	Fundamentals ofNano Science	3	0	0	3

FREE ELECTIVE (VSEM)

S.No	CourseCode	CourseName	L	T	P	C
1	**17150FE54A**	DatabaseManagement System	3	0	0	3
2	**17152FE54A**	Basics ofBiomedicalInstrumentation	3	0	0	3
3	**17154FE54A**	Renewable EnergySources	3	0	0	3
4	**17155FE54A**	Air Pollution and Control Engineering	3	0	0	3
5	**17150FE54B**	Cloud computing	3	0	0	3
6	**17152FE54B**	Sensors and Transducers	3	0	0	3
7	**17154FE54B**	Automatic System	3	0	0	3
8	**17155FE54B**	GeographicInformation System	3	0	0	3

FREE ELECTIVE (VIISEM)

S.No	CourseCode	CourseName	L	T	P	C
1	**17150FE74A**	Introduction to C Programming	3	0	0	3
2	**17152FE74A**	Robotics	3	0	0	3
3	**17154FE74A**	Industrial safety	3	0	0	3
4	**17155FE74A**	GreenBuildingDesign	3	0	0	3
5	**17150FE74B**	Datastructures andAlgorithms	3	0	0	3
6	**17152FE74B**	ElectronicDevices	3	0	0	3
7	**17154FE74B**	Testingof Materials	3	0	0	3
8	**17155FE74B**	Waste waterTreatment	3	0	0	3

HOD **DEAN**

CREDITSDISTRIBUTION

CGPACREDITS

Semester	Core	Elective	Free Elective	Comprehensive Exit Course	RSD Course	Others	Total
I	28	-	-	-	-	-	28
II	28	-	-	-	-	-	28
III	23	-	-	-	-	-	23
IV	25	-	-	-	01	-	26
V	20	-	03	-	03	-	26
VI	15	06	-	-	02	-	23
VII	13	06	03	-	04	-	26
VIII	12	06	-	02	-	-	20
Over ALL Credits							**200**

NONCGPACREDITS

Semester	Addoncourse	Total
I	01	**01**
II	01	**01**
III	-	**-**
IV	-	**-**
V	-	**-**
VI	-	**-**
VII	-	**-**
VIII	-	**-**
Co curricular Activities	In-plant Training,Industrial Visit , Seminars &Conferences	**03**
TOTAL NON-CGPA CREDITS		**05**

TOTAL CREDITS	
CGPA CREDITS	**200**
NON-CGPA CREDITS	**05**
TOTAL	**205**

SYLLABI

17147S11 **COMMUNICATIVE ENGLISH**

L	T	P	C
5	1	0	4

OBJECTIVES:

- Todevelop thebasicreadingandwriting skillsoffirstyear engineeringand technologystudents.
- Tohelplearnersdeveloptheirlisteningskills,which will,enablethemlistentolecturesand comprehend thembyaskingquestions;seeking clarifications.
- Tohelplearnersdevelop theirspeaking skillsandspeakfluentlyin realcontexts.
- Tohelplearnersdevelop vocabulary ofageneralkindbydevelopingtheirreading skills

UNITI SHARING INFORMATION RELATEDTOONESELF/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. **Vocabularydevelopment--**prefixes-suffixes-articles.-count/uncountnouns.

UNITII GENERAL READINGANDFREEWRITING 12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choicequestions and /or short questions/ open-ended questions)-inductive reading- short narratives anddescriptions from newspapersincludingdialoguesandconversations(alsousedasshortListening texts)-register-**Writing**–paragraphwriting-topicsentence-mainideas-freewriting,shortnarrative descriptionsusingsomesuggested vocabularyandstructures–**Listening**-telephonicconversations.**Speaking –** sharing information ofapersonal kind—greeting– taking leave-**Language development**
–prepositions, conjunctions**Vocabularydevelopment-**guessing meaningsofwords in context.

UNITIII GRAMMARANDLANGUAGE 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 tolongertexts and filling up the table- product description- narratives from different sources. **Speaking-**asking about routine actions and expressing opinions. **Language development-** degrees ofcomparison- pronouns- direct vs indirect questions- **Vocabulary development –** single wordsubstitutes-adverbs.

UNITIV READINGAND LANGUAGE DEVELOPMENT 12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing**-letter writing,informalorpersonalletters-e-mails-conventionsofpersonalemail-**Listening**-listening todialoguesorconversationsandcompletingexercisesbasedonthem.**Speaking-**speakingabout oneself-speakingaboutone'sfriend-**Languagedevelopment-**Tenses-simplepresent-simplepast- present continuousandpastcontinuous-**Vocabularydevelopment**-synonyms-antonyms-phrasalverbs

UNITV EXTENDEDWRITING 12

Reading-longertexts-closereading–**Writing-**brainstorming-writingshortessays– developingan outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking** – participating in conversations- short group conversations-**Languagedevelopment**-modal verbs-present/ pastperfecttense-**Vocabularydevelopment-**collocations-fixed andsemi-fixed expressions

REFERENCES

1. Bailey, Stephen. **Academic Writing: A practical guide for students**. New York: Rutledge,2011.
2. Comfort, Jeremy, et al. **Speaking Effectively : Developing Speaking Skillsfor BusinessEnglish.**CambridgeUniversityPress,Cambridge:Reprint2011
3. DuttP. Kiranmaiand RajeevanGeeta. **BasicCommunication Skills,** FoundationBooks: 2013
4. Means,L. Thomas and Elaine Langlois. **English &Communication For Colleges.** CengageLearning,USA:2007
5. Redston, Chris &Gillies Cunningham **Face2Face** (Pre-intermediate Student's Book&Workbook)CambridgeUniversityPress,New Delhi:2005

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17148S12	ENGINEERINGMATHEMATICS-I	L	T	P	C
		5	1	0	4

OBJECTIVES:

- Thegoalofthiscourseistoachieveconceptualunderstandingandtoretainthebesttraditionsof traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for thepurpose of modellingtheengineeringproblemsmathematicallyandobtainingsolutions.Thisisa foundation course which mainly deals with topics such as single variable and multivariablecalculusandplaysan importantroleintheunderstandingofscience,engineering,economicsand computer science, among other disciplines.

UNITI DIFFERENTIAL CALCULUS 12

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules - Maximaand Minimaoffunctionsofonevariable.

UNITII FUNCTIONSOFSEVERALVARIABLES 12

Partialdifferentiation–HomogeneousfunctionsandEuler'stheorem–Totalderivative–Changeofvariables –Jacobians–Partialdifferentiationofimplicitfunctions–Taylor'sseriesforfunctionsoftwovariables–Maximaandminimaoffunctionsoftwovariables–Lagrange'smethodofundeterminedmultipliers.

UNITIII INTEGRALCALCULUS 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 ofirrationalfunctions-Improper integrals.

UNITIV MULTIPLEINTEGRALS 12

Doubleintegrals–Changeoforderofintegration–Doubleintegralsinpolarcoordinates–Areaenclosed byplanecurves–Tripleintegrals–Volumeofsolids–Changeofvariablesindoubleandtripleintegrals.

UNITV DIFFERENTIALEQUATIONS 12

Higherorderlineardifferentialequationswith constantcoefficients-Method ofvariation ofparameters –HomogenousequationofEuler'sandLegendre'stype–Systemofsimultaneouslineardifferentialequations with constantcoefficients-Method ofundeterminedcoefficients.

TOTAL:60 PERIODS

OUTCOMES :

Aftercompletingthiscourse, studentsshould demonstratecompetencyin thefollowingskills:

- Useboththelimitdefinition and rulesofdifferentiationto differentiatefunctions.
- Apply differentiationto solvemaximaandminimaproblems.
- EvaluateintegralsbothbyusingRiemannsumsandbyusingtheFundamentalTheoremof Calculus.
- Applyintegrationtocomputemultipleintegrals,area,volume,integralsinpolarcoordinates,in addition tochangeoforderandchangeofvariables.
- Evaluateintegralsusingtechniquesofintegration,suchassubstitution,partialfractionsand integration byparts.
- Determineconvergence/divergenceof improper integralsand evaluateconvergentimproper integrals.
- Apply varioustechniquesin solving differentialequations.

TEXTBOOKS :

1. GrewalB.S.,“HigherEngineeringMathematics”,KhannaPublishers,NewDelhi,43rd Edition, 2014.
2. JamesStewart,"Calculus:EarlyTranscendentals",CengageLearning,7th Edition,NewDelhi, 2015. [ForUnitsI&III- Sections1.1,2.2,2.3,2.5,2.7(Tangentsproblemsonly),2.8,3.1to3.6, 3.11,4.1,4.3,5.1(Areaproblemsonly),5.2,5.3,5.4(excludingnetchangetheorem),5.5,7.1-7.4 and7.8].

REFERENCES:

1. Anton,H, Bivens, IandDavis,S,"Calculus",Wiley,10th Edition, 2016.
2. JainR.K.andIyengarS.R.K.,“AdvancedEngineeringMathematics”,NarosaPublications,New Delhi,3rdEdition,2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., “Calculus" Volume I and II, S.ViswanathanPublishersPvt. Ltd., Chennai, 2007.
4. SrimanthaPalandBhunia, S.C, "EngineeringMathematics" OxfordUniversityPress, 2015.
5. Weir, M.DandJoel Hass,"ThomasCalculus", 12thEdition,PearsonIndia, 2016.

17149S13 **ENGINEERINGPHYSICS**

L	T	P	C
5	1	0	4

OBJECTIVES
:

- Toenhance the fundamentalknowledge in Physicsanditsapplicationsrelevanttovarious streams ofEngineering andTechnology.

UNITI PROPERTIES OFMATTER 9

Elasticity–Stress-straindiagramanditsuses-factorsaffectingelasticmodulusandtensilestrength –torsionalstressanddeformations–twistingcouple-torsionpendulum:theoryand experiment-bending ofbeams-bendingmoment–cantilever:theoryandexperiment–uniformandnon-uniformbending:theory andexperiment-I-shapedgirders-stressdueto bendinginbeams.

UNITII WAVESANDFIBER 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 coefficientsderivation–resonantcavity,opticalamplification(qualitative)–Semiconductor lasers: homojunctionand heterojunction–Fiberoptics:principle,numericalaperture andacceptanceangle-typesof opticalfibres(material,refractiveindex,mode)–lossesassociatedwithopticalfibers- fibre optic sensors: pressureand displacement.

UNITIII THERMAL PHYSICS 9

Transferofheatenergy –thermalexpansionofsolidsandliquids–expansionjoints-bimetallicstrips -thermalconduction,convectionandradiation –heatconductionsinsolids–thermalconductivity-Forbe’s andLee’sdiscmethod:theoryandexperiment-conductionthroughcompoundmedia(series andparallel)–thermalinsulation–applications:heatexchangers,refrigerators,ovensandsolar waterheaters.

UNITIV QUANTUMPHYSICS 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’swaveequation–timeindependentandtimedependentequations–particlein aone-dimensionalrigidbox – tunnelling(qualitative)-scanningtunnelling microscope.

UNITV CRYSTAL PHYSICS 9

Singlecrystalline,polycrystallineandamorphousmaterials–singlecrystals:unitcell,crystalsystems, 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:pointdefects,linedefects–Burgervectors,stackingfaults–roleofimperfectionsin plastic deformation - growth ofsinglecrystals: solution andmeltgrowth techniques.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion ofthiscourse,

- thestudentswillgain knowledgeonthebasicsofpropertiesofmatteranditsapplications,
- thestudentswillacquireknowledgeontheconceptsofwavesandopticaldevicesandtheir applicationsinfibreoptics,
- thestudentswillhaveadequateknowledgeontheconceptsofthermalpropertiesofmaterials and their applicationsin expansion jointsandheatexchangers,
- thestudentswillgetknowledgeonadvancedphysicsconceptsofquantumtheoryandits applicationsin tunnelingmicroscopes, and
- thestudentswillunderstandthebasicsofcrystals,theirstructuresanddifferentcrystalgrowth techniques.

TEXTBOOKS:

1. Bhattacharya,D.K.&Poonam,T. "Engineering Physics". Oxford UniversityPress,2015.
2. Gaur,R.K.&Gupta,S.L."EngineeringPhysics".DhanpatRaiPublishers, 2012.
3. Pandey,B.K.&Chaturvedi,S. "EngineeringPhysics". CengageLearningIndia,2012.

REFERENCES:

1. Halliday,D.,Resnick,R. &Walker, J."PrinciplesofPhysics".Wiley,2015.
2. Serway,R.A. &Jewett, J.W. "PhysicsforScientistsandEngineers". CengageLearning, 2010.
3. Tipler, P.A.& Mosca,G."PhysicsforScientistsand Engineerswith Modern Physics'. W.H.Freeman, 2007.

17149S14 **ENGINEERINGCHEMISTRY** **L TP C**
5 1 04

OBJECTIVES:

- To makethestudentsconversantwithboilerfeed waterrequirements,relatedproblemsandwater treatment techniques.
- To develop an understandingofthebasicconceptsofphase ruleand itsapplications to singleand two component systemsandappreciatethepurposeandsignificanceofalloys.
- Preparation,propertiesandapplicationsofengineering materials.
- Typesof fuels, calorificvaluecalculations,manufactureof solid, liquid andgaseous fuels.
- Principlesandgenerationofenergyinbatteries,nuclearreactors,solarcells,windmillsandfuelcells.

UNIT I WATERANDITSTREATMENT **9**

Hardnessofwater–types–expressionofhardness–units–estimationofhardnessofwaterbyEDTA– numericalproblems–boilertroubles(scaleandsludge)–treatmentofboilerfeedwater– Internal treatment (phosphate,colloidal, sodiumaluminateandcalgon conditioning)external treatment
–Ion exchangeprocess,zeoliteprocess– desalination ofbrackishwater - ReverseOsmosis.

UNIT II SURFACE CHEMISTRYANDCATALYSIS **9**

Adsorption:Typesofadsorption–adsorptionofgasesonsolids–adsorptionofsolutefromsolutions
– adsorptionisotherms–Freundlich'sadsorptionisotherm–Langmuir'sadsorptionisotherm–contacttheory– kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement.
Catalysis:Catalyst–typesofcatalysis–criteria–autocatalysis–catalyticpoisoningandcatalyticpromoters-acidbasecatalysis–applications(catalyticconvertor)–enzymecatalysis–Michaelis–
Menten equation.

UNITIII ALLOYSANDPHASERULE **9**

Alloys:Introduction-Definition-propertiesofalloys-significanceofalloying,functionsandeffectof 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 - reducedphase rule - thermal analysisandcoolingcurves-twocomponentsystems-lead-silversystem-Pattinsonprocess.

UNITIV FUELSAND 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 syntheticpetrol(Bergiusprocess) -knocking -octane number -dieseloil-cetanenumber -naturalgas-compressednaturalgas(CNG)-liquefiedpetroleumgases(LPG)-poweralcoholandbiodiesel.Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoreticalcalculation of calorific value-ignitiontemperature-spontaneousignitiontemperature-explosiverange- fluegasanalysis(ORSAT Method).

UNITV ENERGYSOURCESANDSTORAGE DEVICES **9**

Nuclearfission-controllednuclearfission-nuclearfusion-differencesbetweennuclearfissionandfusion-
nuclear chain reactions - nuclear energy-light water nuclear power plant - breeder reactor -solarenergy conversion-solarcells-windenergy.Batteries,fuelcellsandsupercapacitors:Typesofbatteries–primary battery (dry cell)secondary battery (leadacidbattery,lithium-ion-battery)fuelcells
–H_2-O_2 fuelcell.

TOTAL:45 PERIODS

OUTCOMES:

- The knowledge gained on engineering materials, fuels, energy sources and water treatmenttechniques willfacilitatebetterunderstanding ofengineering processesand applicationsforfurtherlearning.

TEXTBOOKS:

1. S.S. DaraandS. S.Umare,“ATextbook ofEngineeringChemistry”, S. Chand& CompanyLTD, New Delhi,2015
2. P.C.Jain andMonikaJain,“Engineering Chemistry”Dhanpat RaiPublishing Company(P)LTD, New Delhi,2015
3. S. Vairam, P. Kalyaniand SubaRamesh,“EngineeringChemistry”,WileyIndiaPVT,LTD, New Delhi,2013.

REFERENCES:

1. Friedrich Emich, “EngineeringChemistry”, ScientificInternationalPVT, LTD,NewDelhi, 2014.
2. PrasantaRath, “EngineeringChemistry”, CengageLearning IndiaPVT, LTD,Delhi,2015.
3. Shikha Agarwal,“EngineeringChemistry-FundamentalsandApplications”,CambridgeUniversity Press,Delhi,2015.

17154S15	**ENGINEERINGGRAPHICS**	**L**	**T**	**P**	**C**
		5	**1**	**0**	**4**

OBJECTIVES:

- Todevelopinstudents,graphicsskillsforcommunicationofconcepts,ideasanddesignof Engineering products.
- Toexposethemtoexistingnationalstandardsrelatedtotechnicaldrawings.

CONCEPTSANDCONVENTIONS(NotforExamination) 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.

UNITI PLANECURVESANDFREEHANDSKETCHING 7+12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction ofellipse, parabolaandhyperbolabyeccentricitymethod–Constructionofcycloid–constructionofinvolutesofsquare andcircle–Drawingoftangentsandnormaltotheabovecurves.

VisualizationconceptsandFreeHandsketching:Visualizationprinciples–RepresentationofThree Dimensionalobjects–Layoutofviews-Freehand sketchingofmultipleviewsfrompictorialviewsofobjects

UNITII PROJECTIONOFPOINTS,LINESAND PLANESURFACE 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 - Determinationoftruelengthsandtrueinclinationsbyrotatinglinemethod andtracesProjectionofplanes (polygonalandcircularsurfaces)inclinedtoboththeprincipalplanesbyrotatingobjectmethod.

UNITIII PROJECTIONOFSOLIDS 5+12

Projectionofsimplesolidslikeprisms,pyramids,cylinder,coneandtruncatedsolidswhentheaxisisinclinedto oneoftheprincipalplanesbyrotatingobjectmethod.

UNITIV PROJECTION OFSECTIONEDSOLIDSANDDEVELOPMENTOF SURFACES **5+12**

Sectioningof abovesolidsinsimpleverticalpositionwhenthecuttingplaneisinclinedtotheoneofthe principalplanesandperpendiculartotheother–obtainingtrueshapeofsection.Developmentoflateralsurfaces ofsimple and sectioned solids–Prisms,pyramidscylindersandcones.

UNITV ISOMETRICANDPERSPECTIVEPROJECTIONS **6+12**

Principles of isometricprojection – isometric scale –Isometricprojectionsof simple solids and truncatedsolids-Prisms,pyramids,cylinders,cones- combination of two solid objects in simple verticalpositions-Perspectiveprojectionofsimplesolids-Prisms,pyramidsand cylindersby visualray method.

TOTAL:90 PERIODS

OUTCOMES:

Onsuccessfulcompletionof thiscourse,thestudentwillbeableto

- familiarizewith thefundamentalsandstandardsofEngineering graphics
- performfreehandsketching ofbasicgeometricalconstructionsandmultipleviewsofobjects.
- projectorthographicprojectionsoflinesand planesurfaces.
- drawprojectionsandsolidsanddevelopmentofsurfaces.
- visualizeand to projectisometricandperspective sectionsofsimplesolids.

TEXTBOOK:

1. NatrajanK.V.,“AtextbookofEngineeringGraphics”,DhanalakshmiPublishers,Chennai, 2009.
2. Venugopal K. and Prabhu RajaV., “EngineeringGraphics”, NewAge International (P) Limited, 2008.

REFERENCES:

1. BasantAgarwalandAgarwalC.M.,“EngineeringDrawing”,TataMcGraw HillPublishing Company Limited,New Delhi,2008.
2. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition,2010.
3. GopalakrishnaK.R., “Engineering Drawing” (Vol. I&IIcombined), SubhasStores,Bangalore, 2007.
4. Luzzader, Warren.J. and Duff,John M., “Fundamentals of Engineering Drawing with an introductiontoInteractiveComputerGraphics forDesignandProduction,EasternEconomy Edition,PrenticeHallofIndiaPvt.Ltd,NewDelhi,2005.
5. NSParthasarathyAndVelaMurali,“EngineeringGraphics”,OxfordUniversity,Press,NewDelhi, 2015.
6. Shah M.B.,and Rana B.C.,“EngineeringDrawing”,Pearson,2nd Edition,2009.

PublicationofBureau ofIndianStandards:

1. IS10711– 2001:TechnicalproductsDocumentation–Sizeand layoutofdrawingsheets.
2. IS9609(Parts 0&1)–2001:TechnicalproductsDocumentation–Lettering.
3. IS10714(Part20)–2001&SP46–2003:Linesfortechnicaldrawings.
4. IS11669– 1986&SP46–2003:Dimensioning ofTechnicalDrawings.
5. IS15021(Parts1to4)–2001:Technicaldrawings–Projection Methods.

SpecialpointsapplicabletoUniversityExaminationsonEngineering Graphics:

1. Therewillbefivequestions,eachofeitherortypecoveringallunitsofthesyllabus.
2. Allquestionswillcarryequalmarksof20eachmakingatotalof100.
3. The answer paper shall consist of drawing sheetsof A3 size only. Thestudentswillbe permittedtouseappropriatescaletofitsolutionwithinA3 size.
4. The examination willbeconductedinappropriatesessionson the sameday

17150S16 PROBLEMSOLVINGAND PYTHONPROGRAMMING LTPC
51 04

COURSE OBJECTIVES:

- Toknowthebasicsofalgorithmicproblemsolving
- Toread and writesimplePython programs.
- Todevelop Python programswith conditionalsandloops.
- TodefinePython functionsandcallthem.
- TousePython datastructures–-lists,tuples, dictionaries.
- Todo input/outputwithfiles in Python.

UNITI ALGORITHMICPROBLEMSOLVING 9
Algorithms,buildingblocksofalgorithms(statements,state,controlflow,functions),notation(pseudocode, flow chart, programming language), algorithmic problem solving, simple strategies fordeveloping algorithms(iteration,recursion).Illustrativeproblems:findminimuminalist,insertacardinalistofsorted cards, guessanintegernumberin arange,TowersofHanoi.

UNITII DATA,EXPRESSIONS,STATEMENTS 9
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list;variables, expressions, statements,tupleassignment,precedenceofoperators,comments;modulesandfunctions,function definitionanduse,flowofexecution,parametersandarguments; Illustrativeprograms:exchangethevaluesof twovariables,circulatethevaluesofnvariables,distancebetween two points.

UNITIII CONTROLFLOW, FUNCTIONS 9
Conditionals:Booleanvalues andoperators,conditional(if),alternative (if-else),chainedconditional(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, sumanarray ofnumbers,linearsearch, binarysearch.

UNITIV LISTS,TUPLES,DICTIONARIES 9
Lists:listoperations,listslices,listmethods,listloop,mutability,aliasing,cloninglists,listparameters;Tuples: tupleassignment,tupleasreturnvalue;Dictionaries:operationsandmethods;advancedlistprocessing - list comprehension; Illustrative programs: selection sort, insertion sort, mergesort, histogram.

UNITV FILES,MODULES, PACKAGES 9
Filesandexception:textfiles,readingandwritingfiles,formatoperator;commandlinearguments,errorsand exceptions,handlingexceptions,modules,packages;Illustrativeprograms:wordcount,copyfile.

COURSEOUTCOMES:
Upon completionof thecourse,studentswillbeable to

- Develop algorithmic solutions to simplecomputationalproblems
- Read,write,executebyhand simplePython programs.
- Structure simplePythonprograms forsolving problems.
- DecomposeaPython programinto functions.
- Representcompound datausing Python lists, tuples,dictionaries.
- Read andwritedata from/to filesin Python Programs.

TOTAL:45 PERIODS

TEXTBOOKS:

1. Allen B.Downey,``ThinkPython:HowtoThinkLikeaComputerScientist'',2nd edition,Updated forPython 3, Shroff/O'ReillyPublishers, 2016 (http://greenteapress.com/wp/think-python/)

2. Guido van RossumandFred L.Drake Jr, "AnIntroduction to Python–Revised andupdated forPython 3.2,NetworkTheoryLtd., 2011.

REFERENCES:

1. CharlesDierbach,"Introduction toComputerScienceusing Python:A ComputationalProblem-Solving Focus,WileyIndiaEdition, 2013.
2. JohnVGuttag, "Introduction to Computation and Programming Using Python'',Revised and expanded Edition,MITPress, 2013
3. Kenneth A. Lambert, "Fundamentals ofPython:FirstPrograms", CENGAGELearning,2012.
4. PaulGries, JenniferCampbellandJasonMontojo,"PracticalProgramming:An Introductionto ComputerScienceusingPython 3", Second edition,PragmaticProgrammers,LLC, 2013.
5. RobertSedgewick,KevinWayne,RobertDondero,"Introductionto Programming inPython:AnInter-disciplinaryApproach, PearsonIndiaEducation ServicesPvt. Ltd., 2016.
6. TimothyA.Budd, "Exploring Python",Mc-Graw HillEducation (India)PrivateLtd.,,2015.

17150L17	**PROBLEM SOLVINGANDPYTHONPROGRAMMING LABORATORY**	**LTPC 0 0 32**

COURSE OBJECTIVES:

- Towrite,test, anddebugsimplePython programs.
- ToimplementPython programswith conditionalsand loops.
- Usefunctionsforstructuring Python programs.
- Representcompound datausing Python lists, tuples,dictionaries.
- Read andwritedata from/to filesin Python.

LISTOF PROGRAMS

1. Compute theGCDoftwo numbers.
2. Find thesquarerootofanumber (Newton'smethod)
3. Exponentiation (powerofanumber)
4. Find themaximumofalistofnumbers
5. Linearsearch and Binarysearch
6. Selection sort, Insertionsort
7. Merge sort
8. Firstnprimenumbers
9. Multiplymatrices
10. Programs that takecommand linearguments (wordcount)
11. Find themost frequentwordsin a text readfromafile
12. Simulateellipticalorbitsin Pygame
13. Simulatebouncing ballusing Pygame

PLATFORMNEEDED
Python 3 interpreter forWindows/Linux

COURSEOUTCOMES:
Upon completionof thecourse,studentswillbeable to

- Write, test,and debugsimplePython programs.
- ImplementPython programswith conditionalsand loops.
- Develop Python programsstep-wisebydefiningfunctionsandcallingthem.
- UsePython lists, tuples, dictionariesforrepresentingcompound data.
- Read andwritedata from/to filesin Python.

TOTAL:60 PERIODS

17149L18	**PHYSICSANDCHEMISTRYLABORATORY** **(Common to allbranchesofB.E. /B.Tech Programmes)**	**L T P C** **0 0 3 2**

OBJECTIVES:

- Tointroducedifferentexperimentsto testbasicunderstanding ofphysicsconceptsappliedin optics,thermal physics,propertiesofmatterandliquids.

LISTOFEXPERIMENTS: PHYSICSLABORATORY (Any 5 Experiments)

1. Determination ofrigiditymodulus–Torsion pendulum
2. Determination ofYoung'smodulusbynon-uniformbending method
3. (a)Determination ofwavelength,andparticlesizeusingLaser
   (b)Determination ofacceptanceanglein an opticalfiber.
4. Determination ofthermalconductivity ofabad conductor– Lee'sDiscmethod.
5. Determination ofvelocity ofsound andcompressibilityofliquid – Ultrasonicinterferometer
6. Determination ofwavelength ofmercuryspectrum–spectrometergrating
7. Determination ofbandgap ofa semiconductor
8. Determination ofthickness ofathin wire– Airwedgemethod

OUTCOMES:
Uponcompletion ofthecourse, thestudentswillbeable to **TOTAL:30 PERIODS**

- applyprinciplesofelasticity,opticsandthermalproperties for engineeringapplications.

CHEMISTRYLABORATORY: (Anyseven experiments to be conducted)OBJECTIVES:

- Tomakethestudenttoacquirepracticalskillsinthedetermination ofwaterquality parameters through volumetricandinstrumentalanalysis.
- To acquaint the students with the determination of molecular weight of a pol ymer by viscometery.

1.EstimationofHClusingNa_2CO_3 asprimarystandardandDeterminationofalkalinityin watersample.
2.Determination of total, temporary&permanenthardnessofwaterbyEDTAmethod.
3.Determination ofDO contentofwater samplebyWinkler’smethod.
4.Determination ofchloridecontentofwater samplebyargentometricmethod.
5.Estimation ofcoppercontentofthegiven solutionby Iodometry.
6.Determination ofstrength ofgiven hydrochloricacid usingpHmeter.
7.Determination ofstrength ofacidsin amixtureofacidsusingconductivitymeter.
8.Estimation of ironcontentofthegiven solution using potentiometer.
9.Estimation of ironcontentofthewatersampleusingspectrophotometer (1, 10-Phenanthroline/ thiocyanatemethod).
10.Estimation ofsodiumandpotassiumpresentin waterusingflamephotometer.
11.Determination ofmolecularweightofpolyvinylalcoholusingOstwald viscometer.
12.Pseudofirstorderkinetics-esterhydrolysis.
13.Corrosion experiment-weight lossmethod.
14.Determination ofCMC.
15.Phasechange inasolid.
16.Conductometrictitration ofstrongacid vsstrongbase.

OUTCOMES:

- Thestudentswillbeoutfitted with hands-onknowledge in thequantitativechemicalanalysis ofwaterqualityrelated parameters.

TOTAL:30

PERIODS TEXTBOOKS:

1. Vogel’sTextbookofQuantitativeChemicalAnalysis (8^{TH}edition, 2014)

17147S21

TECHNICALENGLISHL T P C

OBJECTIVES:TheCourseprepares second semesterengineering and Technologystudents to: 3 1 0 4

- Developstrategiesandskillstoenhancetheirabilitytoreadandcomprehendengineeringand technologytexts.
- Fostertheirabilityto writeconvincingjob applicationsandeffective reports.
- Develop theirspeaking skills tomake technicalpresentations, participatein group discussions.
- Strengthen theirlisteningskillwhichwillhelpthemcomprehendlecturesandtalksintheirareasof specialisation.

UNITI INTRODUCTIONTECHNICAL ENGLISH 12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking**–Askingforandgivingdirections-**Reading**–readingshorttechnicaltextsfrom journals- newsapapers- **Writing-** purpose statements – extended definitions – issue- writinginstructions – checklists-recommendations-**Vocabulary Development-** technical vocabulary **LanguageDevelopment**–subjectverb agreement-compoundwords.

UNITII READINGANDSTUDYSKILLS 12

Listening-Listeningtolongertechnicaltalksandcompletingexercisesbasedonthem-**Speaking**– describing aprocess- **Reading**–readinglongertechnicaltexts-identifyingthevarioustransitionsina text-paragraphing- **Writing-** interpretingcgarts,graphs-**VocabularyDevelopment-**vocabularyusedinformalletters/emailsand reports **LanguageDevelopment-**impersonalpassivevoice,numericaladjectives.

UNITIII TECHNICALWRITINGANDGRAMMAR 12

Listening-Listeningtoclassroom lectures/talkls onengineering/technology-**Speaking**–introductionto technicalpresentations- **Reading**–longertextsbothgeneralandtechnical,practiceinspeed reading; **Writing-** Describing a process, use of sequence words- **Vocabulary Development-**sequencewords- Misspelled words.**Language Development-**embedded sentences

UNITIV REPORT WRITING 12

Listening-Listeningtodocumentariesandmakingnotes.**Speaking**–mechanicsofpresentations-**Reading** – readingfordetailedcomprehension-**Writing-**emailetiquette-jobapplication–cover letter– Résumé preparation(via email and hard copy)- analytical essays and issue based essays**--Vocabulary Development-** finding suitable synonyms-paraphrasing-. **Language Development-**clauses- ifconditionals.

UNITV GROUPDISCUSSIONANDJOBAPPLICATIONS 12

Listening- TED/Ink talks; **Speaking** –participating in a group discussion **-Reading**– reading and understandingtechnicalarticles**Writing**– Writingreports-minutesofameeting-accidentandsurvey- **VocabularyDevelopment-verbalanalogiesLanguage Development-**reported speech

TOTAL:60 PERIODS

OUTCOMES:Attheendofthecoursel earnerswillbeable to:

- Read technicaltextsandwritearea-specifictexts effortlessly.
- Listen andcomprehend lecturesandtalksin theirareaofspecialisation successfully.
- Speakappropriatelyand effectivelyin variedformaland informalcontexts.
- Writereportsand winningjob applications.

TEXTBOOKS:

1. Boardofeditors.**FluencyinEnglishACoursebookforEngineeringandTechnology.** OrientBlackswan,Hyderabad:2016
2. Sudharshana.N.PandSaveetha.C.**EnglishforTechnicalCommunication**.Cambridge UniversityPress:NewDelhi, 2016.

REFERENCES

1. Booth-L. Diana**,ProjectWork,**Oxford UniversityPress**,** Oxford:2014.
2. Grussendorf, Marion,**EnglishforPresentations,** Oxford UniversityPress,Oxford:2007
3. Kumar,Suresh. E. **Engineering English**. OrientBlackswan:Hyderabad,2015
4. Means,L.ThomasandElaineLanglois,**English&CommunicationForColleges.** CengageLearning, USA:2007
5. Raman,MeenakshiandSharma,Sangeetha-**Technical CommunicationPrinciplesand Practice.**Oxford UniversityPress:NewDelhi,2014.

Studentscan beaskedto read Tagore, ChetanBhagatandforsuplementaryreading.

17148S22A	ENGINEERING MATHEMATICS – II	L	T	P	C
		5	1	0	4

OBJECTIVES:

- This courseis designed to cover topics such as MatrixAlgebra, Vector Calculus, ComplexAnalysis andLaplaceTransform.MatrixAlgebraisoneofthepowerfultoolstohandlepracticalproblemsarising inthefieldofengineering.Vectorcalculuscanbewidelyusedformodellingthevariouslawsofphysics. ThevariousmethodsofcomplexanalysisandLaplacetransformscanbe used for efficiently solving the problems that occur in various branches of engineering disciplines.

UNITI MATRICES **12**

Eigenvalues and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigenvaluesand Eigenvectors – Cayley-Hamilton theorem – Diagonalization of matrices – Reduction of aquadratic formto canonicalformbyorthogonaltransformation– Natureofquadraticforms.

UNITII VECTORCALCULUS **12**

Gradient anddirectionalderivative – Divergence and curl -Vector identities – Irrotationaland Solenoidalvectorfields–Lineintegraloveraplanecurve–Surfaceintegral-Areaofacurvedsurface- Volume integral - Green's, Gauss divergence and Stoke's theorems – Verification andapplicationin evaluatingline,surface andvolume integrals.

UNITIII ANALYTIC FUNCTIONS **12**

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates-Properties–Harmonicconjugates–Constructionof analyticfunction -Conformal mapping– Mapping byfunctions $w = z+c, cz, \frac{1}{z}, z^2$ -Bilinear transformation.

UNITIV COMPLEXINTEGRATION **12**

Lineintegral-Cauchy'sintegraltheorem– Cauchy'sintegralformula–Taylor'sandLaurent'sseries –Singularities–Residues–Residuetheorem–Applicationofresiduetheoremforevaluationofrealintegrals –Useofcircularcontourand semicircularcontour.

UNITV LAPLACETRANSFORMS **12**

Existenceconditions–Transformsofelementaryfunctions–Transformofunitstepfunctionand unitimpulse function–Basicproperties–Shiftingtheorems-Transformsofderivativesandintegrals–Initialandfinal valuetheorems–Inversetransforms–Convolutiontheorem–Transformofperiodicfunctions–Application tosolutionoflinearsecondorderordinarydifferentialequationswithconstantcoefficients.

OUTCOMES: **TOTAL:60 PERIODS**

Aftersuccessfullycompletingthecourse,thestudentwillhaveagoodunderstandingofthefollowingtopics and theirapplications:

- Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matricesand similarmatrices.
- Gradient, divergenceand curlofavectorpointfunction and relatedidentities.
- Evaluationofline,surfaceandvolumeintegralsusingGauss,StokesandGreen'stheorems and their verification.
- Analyticfunctions,conformalmappingandcomplexintegration.
- Laplace transform andinverse transform of simplefunctions, properties, variousrelated theoremsandapplication todifferentialequationswithconstantcoefficients.

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, NewDelhi, 2016.

REFERENCES:

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

17149S23B **PHYSICSFOR ELECTRONICS ENGINEERING**

L	T	P	C
5	1	0	3

(Common to BME,ME,CC,ECE,EEE, E&I,ICE)

OBJECTI VES:

- To understandthe essential principles of Physics of semiconductor device and Electron transport properties. Becomeproficientinmagnetic,dielectricandopticalpropertiesofmaterialsandnano devices.

UNITI ELECTRICALPROPERTIES OF MATERIALS 9

Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression-Wiedemann-Franzlaw– Success andfailures -electronsinmetals–Particleina three dimensionalbox–degeneratestates–Fermi-Diracstatistics–Densityofenergystates–Electronin periodicpotential:Blochthorem–metalsandinsulators-Energybandsinsolids–tight binding approximation-Electron effectivemass– concept ofhole.

UNITII SEMICONDUCTORPHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect semiconductors – Carrier concentrationinintrinsicsemiconductors–extrinsic semiconductors-CarrierconcentrationinN- type&P-typesemiconductors–Carriertransport:Velocity-electric fieldrelations–driftanddiffusion transport -Einstein's relation – Hall effect and devices – Zener and avalanche breakdown in p-n junctions-Ohmic contacts– tunneldiode-Schottkydiode– MOS capacitor-power transistor.

UNITIII MAGNETICAND DIELECTRICPROPERTIESOFMATERIALS 9

Magnetismin materials – magneticfield and induction – magnetization -magnetic permeabilityand susceptibility–typesofmagneticmaterials–microscopic classificationofmagneticmaterials- Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory. Dielectric materials: Polarization processes – dielectric loss – internal field – Clausius-Mosottirelation-dielectricbreakdown – high-kdielectrics.

UNITIV 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 currentinaP-Ndiode–solarcell–photodetectors-LED–OrganicLED –Laserdiodes–excitons- quantumconfinedStark effect–quantumdotlaser.

UNITV NANOELECTRONICDEVICES 9

Introduction - electron density in bulk material – Size dependence of Fermi energy– quantum confinement–quantumstructures-Densityofstatesinquantumwell,quantumwireandquantumdot structures –Zener-Bloch oscillations – resonant tunneling – quantum interference effects – mesoscopicstructures:conductancefluctuationsandcoherenttransport–Coulombblockadeeffects -SingleelectronphenomenaandSingleelectronTransistor–magneticsemiconductors–spintronics- Carbon nanotubes:Propertiesandapplications.

TOTAL:45 PERIODS

OUTCOMES:

Attheend ofthecourse,the studentswillable to

- gain knowledgeonclassicalandquantumelectron theories,and energyband structuues,
- acquireknowledgeonbasicsofsemiconductorphysicsand itsapplicationsin variousdevices,
- getknowledgeonmagneticand dielectricpropertiesofmaterials,
- have thenecessaryunderstanding onthe functioningofopticalmaterialsforoptoelectronics,
- understandthebasicsofquantumstructuresandtheirapplicationsin spintronicsand carbon electronics.

TEXTBOOKS:

1. Kasap,S.O.“PrinciplesofElectronicMaterialsandDevices”, McGraw-HillEducation,2007.
2. UmeshKMishra&JaspritSingh,“SemiconductorDevicePhysicsandDesign”,Springer, 2008.
3. Wahab,M.A.“SolidStatePhysics:StructureandPropertiesofMaterials”.NarosaPublishing House, 2009.

REFERENCES

1. Garcia, N. & Damask,A. “PhysicsforComputerScienceStudents”. Springer-Verlag, 2012.
2. Hanson,G.W.“FundamentalsofNanoelectronics”. PearsonEducation,2009
3. Rogers, B., Adams, J. &Pennathur, S. “Nanotechnology:Understanding SmallSystems”.CRCPress,2014

17149S24A ENVIRONMENTALSCIENCEAND ENGINEERING LTPC
51 04

OBJECTIVES:

- Tostudythenatureandfactsaboutenvironment.
- To finding and implementing scientific, technological, economic and political solutions to environmentalproblems.
- Tostudythe interrelationship betweenliving organismandenvironment.
- Toappreciatetheimportanceofenvironmentbyassessingitsimpactonthehumanworld; envision the surroundingenvironment,itsfunctionsand itsvalue.
- Tostudythedynamicprocessesandunderstandthefeaturesoftheearth‟sinteriorand surface.
- Tostudy the integrated themesandbiodiversity,naturalresources,pollutioncontrolandwaste management.

UNITI ENVIRONMENT,ECOSYSTEMSANDBIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - conceptofan ecosystem–structureandfunctionofanecosystem–producers,consumersanddecomposers–energy flowin the ecosystem – ecological succession – food chains, food webs and ecologicalpyramids – Introduction, types, characteristic features, structure and function of the (a) forestecosystem(b) grasslandecosystem(c)desertecosystem(d)aquaticecosystems(ponds,streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystemdiversity– biogeographicalclassificationofIndia–valueofbiodiversity:consumptiveuse, productiveuse,social, ethical,aestheticandoptionvalues–Biodiversityatglobal,nationalandlocal levels–Indiaasamega-diversitynation–hot-spotsofbiodiversity–threatstobiodiversity:habitatloss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservationofbiodiversity:In- situandex-situconservationofbiodiversity.Fieldstudyofcommonplants,insects,birds;Fieldstudy of simple ecosystems–pond, river,hillslopes,etc.

UNITII ENVIRONMENTALPOLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c)Soil pollution(d)Marinepollution(e)Noisepollution(f) Thermalpollution(g)Nuclearhazards–solidwaste management:causes,effectsandcontrolmeasuresofmunicipalsolidwastes–roleofan individualin preventionofpollution–pollutioncasestudies–disastermanagement:floods,earthquake,cyclone and landslides.Field studyof localpolluted site–Urban/Rural/Industrial/Agricultural.

UNITIII NATURALRESOURCES 10

Forestresources:Useandover-exploitation,deforestation,casestudies-timberextraction,mining,dams andtheireffectsonforestsandtribalpeople–Waterresources:Useandover-utilizationof surfaceand groundwater,floods,drought,conflictsoverwater,dams-benefitsandproblems–Mineralresources: Use and exploitation, environmental effects of extracting and using mineral resources,case studies – Food resources: World food problems, changes caused by agriculture andovergrazing,effectsof modernagriculture,fertilizer-pesticideproblems,waterlogging,salinity,casestudies–Energyresources: Growingenergyneeds,renewableandnonrenewableenergysources, useofalternateenergysources.case studies–Landresources:Landasaresource,landdegradation,maninducedlandslides,soilerosion and desertification – roleofanindividualinconservationofnaturalresources–Equitableuseofresources forsustainablelifestyles.Field studyof local areatodocumentenvironmentalassets–river/forest/ grassland/hill/mountain.

UNITIV SOCIALISSUES ANDTHE 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-environmentalethics:Issuesandpossiblesolutions–climatechange,globalwarming, acid rain, ozone layer depletion, nuclear accidentsandholocaust,casestudies.–wastelandreclamation–consumerism and waste products – environment production act–Air(Prevention and Control ofPollution) act – Water (Prevention and control of Pollution)act–Wildlifeprotectionact–Forestconservationact–enforcementmachineryinvolvedinenvironmentallegislation-centralandstate pollution controlboards-Publicawareness.

UNITV HUMANPOPULATION ANDTHE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environmentandhumanhealth–humanrights–valueeducation–HIV/AIDS–womenandchild welfare– roleof information technologyin environmentandhuman health– Case studies.

TOTAL:45 PERIODS

OUTCOMES:

- EnvironmentalPollutionorproblemscannotbesolvedbymerelaws.Publicparticipationisan importantaspectwhichservestheenvironmentalProtection.Onewillobtainknowledgeonthe following aftercompletingthecourse.
- Publicawarenessofenvironmentalisatinfantstage.
- Ignoranceandincompleteknowledgehasleadtomisconceptions
- Developmentandimprovementin std. ofliving haslead to seriousenvironmentaldisasters

TEXTBOOKS:

1. BennyJoseph, ‘EnvironmentalScienceandEngineering’,TataMcGraw-Hill, NewDelhi,2006.
2. Gilbert M.Masters, ‘Introduction to Environmental Engineering and Science’, 2nd edition, Pearson Education,2004.

REFERENCES:

1. DharmendraS.Sengar,‘Environmentallaw’,PrenticehallofIndiaPVTLTD,NewDelhi,2007.
2. Erach Bharucha, “Textbook of Environmental Studies”, Universities Press(I) PVT, LTD, Hydrabad,2015.
3. G.TylerMillerandScottE.Spoolman,“EnvironmentalScience”,CengageLearningIndia PVT, LTD,Delhi, 2014.
4. Rajagopalan,R, ‘EnvironmentalStudies-FromCrisis to Cure’, OxfordUniversityPress,2005.

17153S25C **CIRCUIT THEORY**

L	T	P	C
5	1	0	4

OBJECTIVES:

- Tointroduceelectriccircuitsanditsanalysis
- Toimpartknowledgeon solving circuitequationsusing networktheorems
- Tointroducethephenomenonofresonance in coupledcircuits.
- Toeducateon obtainingthetransientresponseofcircuits.
- TointroducePhasordiagramsandanalysisofthreephase circuits

UNITI BASICCIRCUITSANALYSIS 6+6
Resistiveelements-Ohm’sLawResistorsinseriesandparallelcircuits–Kirchoffslaws–Meshcurrent and nodevoltage-methods ofanalysis.

UNITII NETWORKREDUCTIONANDTHEOREMSFORDCANDACIRCUITS 6+6
Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – ReciprocityTheorem– Millman's theorem.

UNITIII TRANSIENT RESPONSEANALYSIS 6+6
LandCelements-TransientresponseofRL,RCandRLCCircuitsusingLaplacetransformfor DC inputandA.C. sinusoidalinput.

UNITIV THREEPHASECIRCUITS 6+6
A.C.circuits–AverageandRMSvalue-PhasorDiagram–Power,PowerFactorandEnergy.- Analysis ofthreephase3-wireand4-wirecircuits with star and delta connected loads, balanced &un balanced – phasor diagram ofvoltagesandcurrents–powermeasurementinthree phase circuits.

UNITV RESONANCEANDCOUPLEDCIRCUITS 6+6
Series and parallelresonance – their frequencyresponse – Qualityfactor and Bandwidth -Selfand mutualinductance–Coefficientofcoupling–Tunedcircuits– Singletuned circuits.

OUTCOMES: **TOTAL:60 PERIODS**

- Abilityto analyseelectricalcircuits
- Abilityto apply circuittheorems
- Abilityto analyse transients

TEXTBOOKS:

1. WilliamH. HaytJr,JackE.Kemmerlyand StevenM.Durbin,“EngineeringCircuits Analysis”,McGraw Hillpublishers, edition,New Delhi, 2013.
2. CharlesK. Alexander, MathewN.O. Sadiku,“FundamentalsofElectricCircuits”,Second Edition, McGraw Hill,2013.
3. AllanH.Robbins,WilhelmC. Miller,“CircuitAnalysisTheoryandPractice”, Cengage LearningIndia, 2013.

REFERENCES

1. ChakrabartiA,“CircuitsTheory(Analysisand synthesis), Dhanpath Rai&Sons,New Delhi,1999.
2. Jegatheesan, R.,“Analysis ofElectricCircuits,”McGrawHill, 2015.
3. JosephA. Edminister, Mahmood Nahri,“Electriccircuits”,Schaum’s series,McGraw-Hill, New Delhi, 2010.
4. ME VanValkenburg,“NetworkAnalysis”,Prentice-HallofIndiaPvtLtd, NewDelhi,

2015.
5. Mahadevan,K.,Chitra, C.,“ElectricCircuitsAnalysis,”Prentice-HallofIndiaPvtLtd., New Delhi, 2015.
6. Richard C. Dorf andJamesA. Svoboda,“Introductionto ElectricCircuits”, 7th Edition, JohnWiley&Sons,Inc. 2015.
7. SudhakarAandShyamMohanSP, “CircuitsandNetworkAnalysisandSynthesis”, McGraw Hill, 2015.

17154S26C BASIC CIVILANDMECHANICALENGINEERING LT P C
51 0 4

OBJECTIVES:
- Toimpart basicknowledgeon CivilandMechanicalEngineering.
- Tofamiliarize thematerialsandmeasurementsused in CivilEngineering.
- Toprovide theexposureonthefundamentalelements ofcivilengineeringstructures.
- Toenable the studentsto distinguish thecomponentsand working principleofpowerplant units, ICengines, and R& ACsystem.

A– OVER VIEW

UNITI SCOPEOFCIVILANDMECHANICALENGINEERING 10
Overview of Civil Engineering - Civil Engineering contributions to the welfare of Society – Specialized sub disciplines in Civil Engineering – Structural, Construction, Geotechnical, Environmental,TransportationandWater ResourcesEngineering

Overview of Mechanical Engineering - Mechanical Engineering contributions to the welfare ofSociety –Specialized sub disciplines in Mechanical Engineering - Production, Automobile, EnergyEngineering-Interdisciplinaryconceptsin CivilandMechanicalEngineering.

B– CIVILENGINEERING

UNITII SURVEYINGAND CIVILENGINEERINGMATERIALS 10

Surveying:Objects–classification–principles–measurementsofdistances–angles–leveling–determination ofareas–contours-examples.

CivilEngineeringMaterials: Bricks–stones–sand–cement–concrete–steel-timber-modern materials

UNITIII BUILDINGCOMPONENTSANDSTRUCTURES 15
Foundations: Types of foundations - Bearing capacity and settlement – Requirement of good foundations.

CivilEngineeringStructures: Brickmasonry–stonemasonry–beams–columns–lintels–roofing –flooring–plastering–floorarea,carpetareaandfloorspaceindex-TypesofBridgesandDams–water supply-sourcesandqualityofwater-Rainwaterharvesting-introductiontohighwayandrailway.

C– MECHANICALENGINEERING

UNITIV INTERNALCOMBUSTIONENGINESANDPOWERPLANTS 15

ClassificationofPowerPlants-Internalcombustionenginesasautomobilepowerplant–Working principle ofPetrolandDieselEngines–Fourstrokeandtwostrokecycles–Comparisonoffourstroke and two stroke engines – Working principle of steam, Gas, Diesel, Hydro -electricandNuclearPowerplants–- working principle of Boilers, Turbines, Reciprocating Pumps (single acting and double acting) and CentrifugalPumps

UNITV REFRIGERATIONANDAIR CONDITIONINGSYSTEM 10

TerminologyofRefrigerationandAirConditioning.Principleofvapourcompressionandabsorptionsystem–Layoutoftypicaldomesticrefrigerator–Windowand Split type roomAirconditioner.

OUTCOMES: **TOTAL:60PERIODS**

Onsuccessfulcompletionof thiscourse,thestudentwillbeableto

- appreciatetheCivilandMechanicalEngineering componentsofProjects.
- explaintheusageofconstruction materialand properselection ofconstructionmaterials.
- measuredistances andareabysurveying
- identifythecomponentsused inpowerplantcycle.
- demonstrateworkingprinciplesofpetrolanddieselengine.
- elaboratethecomponentsofrefrigeration and Air conditioningcycle.

TEXTBOOKS:

1. ShanmugamGandPalanichamyMS,“BasicCivilandMechanicalEngineering”,TataMcGraw HillPublishingCo.,NewDelhi,1996.

REFERENCES:

1. Palanikumar, K. BasicMechanicalEngineering, ARS Publications,2010.
2. RamamruthamS.,“BasicCivil Engineering”,DhanpatRaiPublishingCo.(P)Ltd.1999.
3. Seetharaman S.,“BasicCivilEngineering”,AnuradhaAgencies,2005.
4. ShanthaKumar SRJ.,“Basic MechanicalEngineering”, Hi-tech Publications, Mayiladuthurai, 2000.
5. VenugopalK. and PrahuRajaV.,“BasicMechanicalEngineering”,AnuradhaPublishers, Kumbakonam,2000.

17154L27 ENGINEERINGPRACTICES LABORATORY L TP C
00 32

OBJECTIVES:

- Toprovideexposuretothestudentswithhandsonexperienceonvariousbasicengineeringpractices in Civil,Mechanical,ElectricalandElectronicsEngineering.

GROUPA(CIVIL& MECHANICAL)

I CIVIL ENGINEERINGPRACTICE 13

Buildings:

(a)Studyofplumbingandcarpentrycomponentsofresidentialandindustrialbuildings. Safety aspects.

Plumbing Works:

(a)Study ofpipelinejoints, itslocation and functions:valves,taps,couplings,unions, reducers, elbows in householdfittings.
(b)Study ofpipeconnections requirementsforpumpsand turbines.
(c)Preparation ofplumbinglinesketches forwatersupplyandsewageworks.(d) Hands-on-exercise:

Basicpipeconnections–Mixed pipematerialconnection – Pipeconnectionswith differentjoining components.

(e)Demonstration ofplumbingrequirementsofhigh-risebuildings.

Carpentryusing Power Toolsonly:

(a)Study of thejointsin roofs, doors, windowsandfurniture. (b) Hands-on-exercise:
Wood work,jointsby sawing,planing andcutting.

II MECHANICAL ENGINEERINGPRACTICE 18

Welding:

(a)Preparation ofbuttjoints,lapjointsandT-jointsbyShieldedmetalarcwelding. (b) Gaswelding practice

BasicMachining:

(a) SimpleTurningandTaperturning
(b)Drilling Practice

SheetMetalWork:

(a)Forming&Bending:
(b)Modelmaking – Traysand funnels.(c) Differenttypeofjoints.

Machineassemblypractice:

(a)Study ofcentrifugalpump
(b)Study ofairconditioner

Demonstration on:

(a)Smithyoperations,upsetting, swaging, settingdown andbending.Example– Exercise– Production ofhexagonalheadedbolt.
(b)Foundryoperationslikemould preparation forgearandstepconepulley.
(c)Fitting– Exercises– Preparation ofsquarefitting and V–fitting models.

GROUPB(ELECTRICAL&ELECTRONICS)

III ELECTRICAL ENGINEERINGPRACTICE 13

1.Residentialhousewiringusingswitches, fuse,indicator, lamp andenergymeter.
2.Fluorescentlampwiring.
3.Staircasewiring
4.Measurementofelectricalquantities– voltage, current, power&powerfactorinRLCcircuit.
5.Measurementofenergyusing singlephaseenergymeter.
6.Measurementofresistance to earth ofanelectricalequipment.

IV ELECTRONICS ENGINEERINGPRACTICE 16

1.StudyofElectroniccomponentsandequipments–Resistor,colourcoding measurement ofACsignalparameter (peak-peak, rmsperiod, frequency)using CR.
2.Study oflogicgatesAND, OR, EX-OR andNOT.
3.Generation ofClockSignal.

4.Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5.MeasurementofripplefactorofHWRandFWR.

OUTCOMES:
Onsuccessfulcompletionof thiscourse,thestudentwillbeableto

TOTAL:60 PERIODS

- fabricatecarpentrycomponentsand pipeconnectionsincluding plumbingworks.
- usewelding equipmentstojoin thestructures.
- Carryoutthebasicmachining operations Make
- themodelsusing sheetmetalworks
- Illustrateoncentrifugalpump, Airconditioner,operationsof smithy,foundary andfittings
- Carryoutbasichome electricalworksandappliances
- Measure theelectricalquantities
- Elaborateonthecomponents,gates, soldering practices.

CIVIL

LIST OFEQUIPMENTFORABATCHOF30 STUDENTS:

1.Assortedcomponentsforplumbingconsisting ofmetallicpipes, plastic pipes, flexible pipes, couplings, unions, elbows,plugsand otherfittings.	15 Sets.
2.Carpentryvice(fittedto workbench)	15 Nos.
3.Standardwoodworkingtools	15 Sets.
4. Modelsofindustrial trusses, door joints,furniturejoints	5 each
5.PowerTools:(a)RotaryHammer	2 Nos
(b)Demolition Hammer	2 Nos (c)
CircularSaw	2 Nos (d)
Planer	2 Nos (e)
HandDrilling Machine	2 Nos (f)
Jigsaw	2 Nos

MECHANICAL

1.Arcwelding transformerwithcablesand holders	5 Nos.
2.Welding boothwith exhaustfacility	5 Nos.
3.Welding accessorieslikewelding shield,chipping hammer, wirebrush,etc.	5 Sets.
4.Oxygen andacetylenegascylinders,blowpipeand other welding outfit.	2 Nos.
5.Centrelathe	2 Nos.
6.Hearthfurnace, anvilandsmithytools	2 Sets.
7. Moulding table,foundrytools	2 Sets.
8.PowerTool:AngleGrinder	2 Nos
9.Study-purposeitems:centrifugalpump,air-conditioner	Oneeach.

ELECTRICAL

1.Assorted electrical componentsforhousewiring 15 Sets
2.Electricalmeasuring instruments 10 Sets
3.Studypurpose items:Iron box, fan andregulator, emergencylamp 1 each
4. Megger (250V/500V) 1 No.
5.PowerTools:(a)RangeFinder 2 Nos
(b)DigitalLive-wiredetector 2 Nos

ELECTRONICS

1.Solderingguns 10 Nos.
2.Assorted electroniccomponentsformakingcircuits 50 Nos.
3.SmallPCBs 10 Nos.
4. Multimeters 10 Nos.
5.Studypurpose items:Telephone, FMradio, low-voltagepowersupply

17153L28C ELECTRIC CIRCUITS LABORATORY L T P C
0 0 3 2

OBJECTIVES:

- To simulatevariouselectriccircuitsusing Pspice/Matlab/e-Sim/Scilab
- Togain practical experienceon electric circuitsandverification of theorems.

LISTOFEXPERIMENTS

1. Simulation andexperimentalverification ofelectricalcircuitproblemsusingKirchhoff's voltageandcurrent laws.
2. Simulation andexperimentalverification ofelectricalcircuitproblemsusing Thevenin's theorem.
3. Simulation andexperimentalverification ofelectricalcircuitproblemsusing Norton's theorem.
4. Simulation andexperimentalverification ofelectricalcircuitproblemsusing Superposition theorem.
5. Simulation andexperimentalverification ofMaximumPowertransferTheorem.
6. Study ofAnalog anddigitaloscilloscopesand measurementof sinusoidalvoltage, frequencyandpowerfactor.
7. Simulation andExperimentalvalidation ofR-Celectriccircuittransients.
8. Simulation andExperimentalvalidation offrequencyresponseof RLCelectric circuit.
9. Design andSimulation of seriesresonancecircuit.
10. Design andSimulation of parallelresonantcircuits.
11. Simulation of threephasebalanced andunbalanced star, deltanetworks circuits.

OUTCOMES: **TOTAL:60 PERIODS**

- Understandandapply circuittheoremsandconcepts in engineeringapplications.
- Simulateelectriccircuits.

LISTOFEQUIPMENTFORABATCHOF30STUDENTS:

1 RegulatedPowerSupply:0– 15VD.C -10 Nos/Distributed PowerSource.
2 FunctionGenerator (1MHz)-10 Nos.
3 SinglePhaseEnergyMeter-1No.
4 Oscilloscope(20 MHz) -10 Nos.
5 DigitalStorageOscilloscope (20 MHz)– 1 No.
6 10Nos.of PCwithCircuit SimulationSoftware(min10Users)(e-Sim/ Scilab/Pspice/MATLAB /otherEquivalentsoftwarePackage)andPrinter (1No.)
7 AC/DC-Voltmeters(10Nos.),Ammeters (10Nos.)and Multi-meters (10Nos.)
8 SinglePhaseWattmeter– 3 Nos.
9 DecadeResistanceBox,DecadeInductanceBox,DecadeCapacitanceBox-6Nos each.
10 CircuitConnectionBoards-10 Nos.NecessaryQuantitiesofResistors,Inductors, Capacitorsofvariouscapacities (QuarterWattto 10Watt

17149S31C TRANSFORMSANDPARTIAL DIFFERENTIAL EQUATIONS **L T P C**
3 1 0 4

OBJECTIVES :

- Tointroducethebasicconceptsof PDEforsolvingstandard partialdifferentialequations.
- TointroduceFourierseriesanalysiswhichiscentraltomanyapplicationsinengineeringapartfromits usein solving boundaryvalueproblems.
- ToacquaintthestudentwithFourierseriestechniquesinsolvingheatflowproblemsusedinvarious situations.
- Toacquaint thestudentwith Fouriertransformtechniquesusedin widevariety of situations.
- Tointroducetheeffectivemathematicaltoolsforthesolutionsofpartialdifferentialequationsthat modelseveralphysicalprocessesandtodevelopZtransform techniquesfordiscretetime systems.

UNITI PARTIAL DIFFERENTIAL EQUATIONS 12
Formationof partialdifferentialequations–Singularintegrals-Solutionsofstandardtypesoffirstorder partialdifferentialequations-Lagrange'slinearequation-Linearpartialdifferentialequationsofsecond and higherorderwithconstantcoefficientsofbothhomogeneousandnon-homogeneous types.

UNITII FOURIER SERIES 12
Dirichlet'sconditions–GeneralFourierseries–Oddandevenfunctions–Halfrangesineseries–Half rangecosine series–ComplexformofFourier series–Parseval'sidentity– Harmonicanalysis.

UNITIII APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12
Classification of PDE – Method of separation of variables - Fourier Series Solutions of one dimensionalwaveequation–Onedimensionalequationofheatconduction –Steadystatesolutionoftwo dimensionalequation ofheatconduction.

UNITIV FOURIER TRANSFORMS 12
Statement of Fourier integral theorem – Fourier transform pair – Fourier sine and cosinetransforms–Properties–Transformsofsimplefunctions–Convolutiontheorem–Parseval'sidentity.

UNITV Z-TRANSFORMS AND DIFFERENCE EQUATIONS 12
Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) –Initial andfinalvaluetheorems-Convolutiontheorem-Formationof difference equations–Solutionofdifference equationsusing Z -transform.

TOTAL: 60 PERIODS

OUTCOMES :

Upon successfulcompletion of thecourse, studentsshould beableto:

- Understandhowto solve thegiven standard partialdifferentialequations.
- SolvedifferentialequationsusingFourierseriesanalysiswhichplaysavitalroleinengineering applications.
- Appreciate the physical significance of Fourier series techniques in solving one and two dimensionalheatflowproblemsandonedimensional waveequations.
- Understand themathematicalprinciplesontransformsandpartialdifferentialequationswouldprovide themtheabilitytoformulateandsolve someof thephysicalproblemsofengineering.
- Usetheeffectivemathematicaltoolsforthesolutionsofpartialdifferentialequationsbyusing Ztransformtechniquesfordiscretetime systems.

TEXTBOOKS :

1. GrewalB.S.,“HigherEngineeringMathematics",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.ViswanathanPublishersPvt. Ltd, Chennai,1998.

REFERENCES:

1. Andrews,L.CandShivamoggi,B, "IntegralTransforms forEngineers"SPIE Press,1999.
2. Bali. N.P and Manish Goyal, "A Textbook of Engineering Mathematics", 9th Edition, Laxmi PublicationsPvt. Ltd, 2014.
3. Erwin Kreyszig,"AdvancedEngineeringMathematics ",10th Edition, JohnWiley, India, 2016.
4. James, G., "Advanced Modern Engineering Mathematics", 3rdEdition,Pearson Education, 2007.
5. Ramana.B.V.,"HigherEngineeringMathematics",McGrawHillEducationPvt.Ltd,NewDelhi, 2016.
6. Wylie,R.C.andBarrett,L.C.,“AdvancedEngineeringMathematics“TataMcGrawHillEducation Pvt.Ltd,6th Edition, NewDelhi,2012.

17153C32	DIGITALLOGIC CIRCUITS	L	T	P	C
		3	1	0	3

OBJECTIVES:

- To studyvariousnumber systemsandsimplifythelogicalexpressionsusing Boolean functions
- Tostudycombinationalcircuits
- Todesign various synchronousandasynchronouscircuits.
- Tointroduceasynchronoussequentialcircuitsand PLDs
- Tointroducedigitalsimulationfordevelopmentofapplication oriented logic circuits.

UNITI NUMBERSYSTEMSAND DIGITAL LOGICFAMILIES 6+6

Review of number systems, binary codes, error detection and correction codes (Parity and Hamming code) - Digital Logic Families -comparison of RTL, DTL, TTL, ECL and MOS families-operation,characteristicsofdigitallogicfamily.

UNITII COMBINATIONAL CIRCUITS 6+6

Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimization using K maps - simplification and implementation of combinational logic – multiplexers and de multiplexers - code converters, adders, subtractors, EncodersandDecoders.

UNITIII SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6

Sequentiallogic-SR, JK, DandTflipflops-leveltriggering andedgetriggering-counters-asynchronous and synchronous type - Modulo counters - Shift registers - design of synchronoussequentialcircuits–MooreandMelaymodels-Counters,statediagram;state reduction;stateassignment.

UNITIV ASYNCHRONOUS SEQUENTIAL CIRCUITSANDPROGRAMMABILITYLOGIC DEVICES 6+6

Asynchronous sequential logic circuits-Transition tability, flow tability-race conditions,hazards &errors in digital circuits; analysis of asynchronous sequential logic circuits-introductionto ProgrammabilityLogicDevices:PROM– PLA–PAL,CPLD-FPGA.

UNITV VHDL 6+6

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages– Subprograms–
Testbench.(Simulation/TutorialExamples:adders,counters,flipflops,Multiplexers&Demultiplexers).

OUTCOMES: TOTAL:60PERIODS

- Abilityto design combinationalandsequentialCircuits.
- Abilityto simulateusingsoftwarepackage.
- Abilityto studyvarious number systemsandsimplifythelogical expressionsusing Booleanfunctions
- Abilityto design various synchronousandasynchronouscircuits.
- Abilityto introduceasynchronous sequentialcircuitsandPLDs
- Abilitytointroducedigitalsimulationfordevelopmentofapplicationorientedlogic circuits.

TEXTBOOKS:

1. JamesW.Bignel,DigitalElectronics,Cengagelearning,5thEdition,2007.
2. M.MorrisMano,'DigitalDesignwithanintroductiontotheVHDL',Pearson Education,2013.
3. Comer"DigitalLogic&StateMachineDesign,Oxford,2012.

REFERENCES

1. Mandal,"DigitalElectronicsPrinciples&Application,McGrawHillEdu,2013.
2. WilliamKeitz,DigitalElectronics-APracticalApproachwithVHDL,Pearson,2013.
3. ThomasL.Floyd,'DigitalFundamentals',11thedition,PearsonEducation,2015.
4. CharlesH.Roth,Jr,LizyLizyKurianJohn,'DigitalSystemDesignusingVHDL,Cengage, 2013.
5. D.P.Kothari,J.S.Dhillon,'DigitalcircuitsandDesign',PearsonEducation,2016.

17153C33	ELECTROMAGNETICTHEORY	L	T	P	C
		2	2	0	3

OBJECTIVES:

- Tointroducethebasicmathematicalconceptsrelatedtoelectromagneticvectorfields
- Toimpartknowledgeon theconceptsof
  - Electrostaticfields,electricalpotential,energydensity and theirapplications.
  - Magneto staticfields,magneticfluxdensity,vectorpotentialanditsapplications.
  - Different methodsofemfgenerationandMaxwell'sequations
  - Electromagneticwavesandcharacterizing parameters

UNITI ELECTROSTATICS– I 6+6

Sourcesandeffectsofelectromagneticfields–CoordinateSystems–Vectorfields–Gradient,Divergence, Curl – theorems and applications - Coulomb's Law – Electric field intensity – Fieldduetodiscreteand continuouscharges–Gauss'slawandapplications.

UNITII ELECTROSTATICS– II 6+6

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field,Utilization factor– Electricfieldinfreespace,conductors,dielectrics-Dielectricpolarization–Dielectric strength-Electricfieldinmultipledielectrics–Boundaryconditions,Poisson'sandLaplace'sequations,Capacitance, Energydensity,Applications.

UNITIII MAGNETOSTATICS 6+6

Lorentzforce,magneticfieldintensity(H)–Biot–Savart'sLaw-Ampere'sCircuitLaw–Hduetostraight conductors,circularloop,infinitesheetofcurrent,Magneticfluxdensity(B)–Binfreespace, conductor, magnetic materials – Magnetization, Magnetic field in multiple media –Boundary conditions, scalar andvectorpotential,Poisson'sEquation,Magneticforce,Torque, Inductance,Energydensity,Applications.

UNITIV ELECTRODYNAMICFIELDS 6+6

Magnetic Circuits-Faraday's law–Transformer and motional EMF – Displacement current-Maxwell's equations(differentialandintegralform)–Relationbetweenfieldtheoryandcircuittheory– Applications.

UNITV ELECTROMAGNETICWAVES 6+6

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics,conductors-skindepth- Poynting vector– Plane wave reflection andrefraction.

TOTAL:60 PERIODS

OUTCOMES:

- Abilitytounderstandthebasicmathematicalconceptsrelatedtoelectromagneticvectorfields.
- Abilitytounderstandthebasicconceptsaboutelectrostaticfields,electricalpotential, energy densityand theirapplications.
- Abilitytoacquiretheknowledgeinmagnetostaticfields,magneticfluxdensity,vectorpotential anditsapplications.
- Abilitytounderstand thedifferentmethodsofemfgeneration andMaxwell'sequations
- Ability to understand the basic concepts electromagnetic waves and characterizingparameters
- AbilitytounderstandandcomputeElectromagneticfieldsandapplythemfordesignand analysisof electricalequipmentand systems

TEXTBOOKS:

1. MathewN.O.Sadiku,'PrinciplesofElectromagnetics',6thEdition,OxfordUniversity PressInc. Asian edition, 2015.
2. WilliamH.HaytandJohnA.Buck,'EngineeringElectromagnetics',McGrawHillSpecial Indian edition,2014.
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions,Fifth Edition,2010

REFERENCES

1. V.V.Sarwate, 'Electromagnetic fields and waves', First Edition, Newage Publishers, 1993.
2. J.P.Tewari, 'Engineering Electromagnetics - Theory, Problems and Applications', Second Edition, KhannaPublishers.
3. Joseph.A.Edminister,'Schaum'sOutlineofElectromagnetics,ThirdEdition(Schaum's OutlineSeries), McGrawHill,2010.
4. S.P.Ghosh,LipikaDatta,'ElectromagneticFieldTheory',FirstEdition,McGraw Hill Education(India)PrivateLimited, 2012.
5. KA Gangadhar,'ElectromagneticFieldTheory',KhannaPublishers;Eighth Reprint: 2015

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17153C34	ELECTRICALMACHINES– I	L	T	P	C
		2	2	0	3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Magnetic-circuitanalysisand introducemagneticmaterials
- Constructional details, the principle of operation, prediction of performance, the methodsof testingthe transformersandthreephasetransformerconnections.
- Working principles of electrical machines using the concepts of electromechanicalenergy conversionprinciplesandderiveexpressions forgeneratedvoltageandtorque developedinall ElectricalMachines.
- Working principles of DC machines as Generator types, determination of their no-load/loadcharacteristics, starting andmethodsofspeedcontrolofmotors.
- VariouslossestakingplaceinD.C.Motorandtostudythedifferenttestingmethodsto arriveat theirperformance.

UNITI MAGNETIC CIRCUITS ANDMAGNETICMATERIALS 6+6

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformerasamagneticallycoupled circuit.

UNITII TRANSFORMERS 6+6

Construction–principleof operation–equivalentcircuitparameters–phasordiagrams,losses– testing–efficiency andvoltageregulation-allday efficiency-Sumpner'stest,perunit representation– inrushcurrent-threephasetransformers-connections–ScottConnection –Phasingoftransformer–paralleloperationofthreephasetransformers-autotransformer– tap changingtransformers-tertiarywinding.

UNITIII ELECTROMECHANICAL ENERGYCONVERSIONAND CONCEPTS IN ROTATINGMACHINES 6+6

Energyinmagneticsystem–Fieldenergyandcoenergy-forceandtorqueequations–singly and multiply excited magnetic field systems-mmf of distributed windings – WindingInductances-, magnetic fields in rotating machines – rotating mmf waves – magneticsaturationand leakage fluxes.

UNITIV DC GENERATORS 6+6

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMF equations– circuit model – armature reaction –methods of excitation-commutation-interpoles compensating winding –characteristicsofDCgenerators.

UNITV DCMOTORS 6+6

Principleandoperations-typesofDCMotors–SpeedTorqueCharacteristicsofDCMotors-starting and speed control of DC motors –Plugging, dynamic and regenerative braking-testingand efficiency–Retardationtest-Swinburne'stestandHopkinson'stest-Permanent MagnetDC (PMDC)motors-applicationsofDC Motor

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OUTCOMES: **TOTAL: 60PERIODS**

- Abilityto analyze themagnetic-circuits.

- Abilityto acquire theknowledgein constructionaldetailsof transformers.
- Abilityto understandtheconcepts ofelectromechanicalenergyconversion.
- Abilityto acquire theknowledgein workingprinciples ofDCGenerator.
- Abilityto acquire theknowledgein workingprinciples ofDCMotor
- Abilityto acquire theknowledgein variouslossestakingplacein D.C. Machines

TEXTBOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt.Ltd, 2010.
2. P.C.Sen'PrinciplesofElectricMachinesandPowerElectronics'JohnWiley&Sons; 3rd Edition 2013.
3. Nagrath, I.J.andKothari.D.P., ElectricMachines',McGraw-HillEducation, 2004

REFERENCES

1. TheodoreWildi, "ElectricalMachines, Drives,andPowerSystems",Pearson Education.,(5th Edition), 2002.
2. B.R. Gupta,'FundamentalofElectricMachines'NewageInternationalPublishers,3rd Edition ,Reprint2015.
3. S.K.Bhattacharya,'ElectricalMachines'McGraw- HillEducation, NewDelhi,3rd Edition,2009.
4. VincentDelToro, 'BasicElectricMachines'PearsonIndiaEducation, 2016.
5. SurinderPalBali, 'ElectricalTechnologyMachines&Measurements, Vol.II, Pearson, 2013.
6. Fitzgerald.A.E.,CharlesKingselyJr,StephenD.Umans,'ElectricMachinery',Sixth edition, McGrawHillBooksCompany, 2003.

17153C35 **ELECTRON DEVICES AND CIRCUITS** **L T P C**
3 0 0 3

OBJECTIVES:

The studentshould bemade to:

- Understandthe structureofbasicelectronicdevices.
- Beexposedto activeand passivecircuitelements.
- Familiarize theoperation and applicationsoftransistorlikeBJTand FET.
- Explore thecharacteristicsofamplifiergain andfrequencyresponse.
- Learn the requiredfunctionality ofpositiveandnegativefeedbacksystems.

UNITI PNJUNCTION DEVICES 9

PN junction diode –structure, operation and V-I characteristics, diffusion and transition capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes, Zener diodecharacteristics-ZenerReversecharacteristics– Zenerasregulator

UNITII TRANSISTORSANDTHYRISTORS 9

BJT,JFET,MOSFET-structure,operation,characteristicsandBiasingUJT,ThyristorsandIGBT-Structure andcharacteristics.

UNITIII AMPLIFIERS 9

BJTsmallsignalmodel–AnalysisofCE,CB,CCamplifiers-Gainandfrequencyresponse–MOSFETsmall signal model– Analysis of CS and Source follower – Gain and frequency response- Highfrequency analysis.

UNITIV MULTISTAGEAMPLIFIERSAND DIFFERENTIALAMPLIFIER 9

BIMOScascadeamplifier,Differentialamplifier–CommonmodeandDifferencemodeanalysis–FETinput stages–Singletunedamplifiers–Gainandfrequencyresponse–Neutralizationmethods,poweramplifiers –Types (Qualitativeanalysis).

UNITV FEEDBACKAMPLIFIERSANDOSCILLATORS 9

Advantagesofnegativefeedback–voltage/current,series,Shuntfeedback–positivefeedback–Condition foroscillations,phase shift–Wienbridge,Hartley,ColpittsandCrystaloscillators.

OUTCOMES: TOTAL :45PERIODS

Upon Completionof thecourse, thestudentswillbe abilityto:

- Explain thestructureandworking operationofbasicelectronicdevices.
- Ableto identifyanddifferentiatebothactiveand passiveelements
- Analyze thecharacteristics ofdifferentelectronicdevicessuch asdiodesand transistors
- Chooseand adapt therequired componentstoconstructan amplifiercircuit.
- Employtheacquiredknowledge in design andanalysisofoscillators

TEXTBOOKS:

1..David A.Bell,"Electronicdevicesand circuits", OxfordUniversityhighereducation, 5th edition 2008.

2. Sedra andsmith, "Microelectroniccircuits",7thEd.,Oxford UniversityPress

REFERENCES:

1.Balbir Kumar,Shail.B.Jain,"Electronicdevicesand circuits"PHIlearningprivatelimited,2nd edition 2014.

2.ThomasL.Floyd,"Electronicdevices"Conventionalcurrentversion, Pearsonprenticehall, 10th Edition, 2017.

3.Donald A Neamen, "ElectronicCircuitAnalysisand Design"TataMcGrawHill,3rd Edition, 2003.

4.RobertL.Boylestad,"Electronicdevicesandcircuittheory",2002.

5.RobertB.Northrop, "AnalysisandApplication ofAnalogElectronicCircuits toBiomedical Instrumentation",CRCPress,2004.

17153C36 **POWER PLANTENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVE:

- ProvidinganoverviewofPowerPlantsanddetailingtheroleofMechanicalEngineersintheir operation and maintenance.

UNITI COALBASEDTHERMALPOWERPLANTS 9

Rankine cycle - improvisations, Layout of modern coal power plant, Super Critical Boilers,FBC Boilers, Turbines, Condensers, Steam &Heat rate, Subsystems of thermal power plants –Fuel and ash handling,Draughtsystem,Feedwatertreatment.BinaryCyclesandCogenerationsystems.

UNITII DIESEL, GASTURBINEAND COMBINED CYCLEPOWERPLANTS 9

Otto,Diesel,Dual&BraytonCycle-Analysis &Optimisation.Componentsof DieselandGasTurbine powerplants.CombinedCyclePowerPlants.IntegratedGasifierbasedCombinedCycle systems.

UNITIII NUCLEARPOWERPLANTS 9

Basics of Nuclear Engineering, Layout and subsystems of Nuclear Power Plants, Working ofNuclear Reactors : Boil*ing Water Reactor* (BWR), P*ressurized Water Reactor* (PWR), CANada Deuterium-Uraniumreactor(CANDU),Breeder,GasCooledandLiquidMetalCooledReactors.Safetymeasuresfor NuclearPowerplants.

UNITIV POWERFROMRENEWABLEENERGY 9

HydroElectricPowerPlants–Classification,TypicalLayoutandassociatedcomponentsincluding Turbines. Principle, Construction and working of Wind, Tidal, *Solar* Photo Voltaic (SPV),SolarThermal,Geo Thermal, BiogasandFuel Cellpowersystems.

UNITV ENERGY, ECONOMICAND ENVIRONMENTALISSUES OF POWERPLANTS 9

Powertarifftypes,Loaddistributionparameters,loadcurve,Comparisonofsiteselectioncriteria,relative merits &demerits, Capital &Operating Cost of different power plants. Pollutioncontrol technologiesincludingWasteDisposal OptionsforCoalandNuclearPowerPlants.

OUTCOMES: **TOTAL :45PERIODS**

Upon thecompletionofthiscoursethestudentswillbeable to

CO1 Explainthelayout,constructionandworkingofthecomponentsinsideathermalpowerplant.

CO2 Explainthelayout,constructionandworkingofthecomponentsinsideaDiesel,Gasand Combinedcyclepowerplants.

CO3 Explainthelayout,constructionandworkingofthecomponentsinsidenuclearpowerplants. CO4 Explainthelayout,constructionandworkingofthecomponentsinsideRenewable energy powerplants.

CO5 Explaintheapplicationsofpowerplantswhileextendtheirknowledgetopowerplant economicsandenvironmentalhazardsandestimatethecostsof electricalenergyproduction.

TEXTBOOK:

1. Nag.P.K.,"PowerPlantEngineering",ThirdEdition,TataMcGraw–HillPublishingCompany Ltd.,2008.

REFERENCES:

1. El-Wakil.M.M.,"Power PlantTechnology",TataMcGraw–HillPublishingCompanyLtd., 2010.

2. GodfreyBoyle,"Renewableenergy",OpenUniversity,OxfordUniversityPressinassociation with the Open University,2004.
3. ThomasC.Elliott,KaoChenandRobertC.Swanekamp,"PowerPlantEngineering",Second Edition,Standard Handbookof McGraw– Hill,1998.

17153L37	ELECTRONICS LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

- Toenabilitythestudentstounderstandthebehaviorofsemiconductordevicebasedon experimentation.

LISTOFEXPERIMENTS

1. CharacteristicsofSemiconductor diodeand Zenerdiode
2. Characteristicsof aNPNTransistor undercommonemitter,commoncollectorand common baseconfigurations
3. CharacteristicsofJFET anddrawtheequivalentcircuit
4. CharacteristicsofUJTandgeneration ofsawtooth waveforms
5. Design andFrequencyresponsecharacteristicsofaCommon Emitteramplifier
6. Characteristicsofphoto diode&phototransistor,Study oflightactivatedrelay circuit
7. Design andtesting ofRC phase shiftandLCoscillators
8. SinglePhasehalf-waveandfullwave rectifierswithinductiveandcapacitivefilters
9. DifferentialamplifiersusingFET
10. Study ofCROforfrequencyandphasemeasurements
11. Realization ofpassivefilters

OUTCOMES:

- Abilityto understandandanalyseelectroniccircuits**.**

TOTAL:60 PERIODS

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

1.Semiconductordevices likeDiode,ZenerDiode,NPNTransistors,JFET, UJT, Photo diode, PhotoTransistor
2.Resistors,Capacitorsand inductors
3.Necessary digitalIC8
4.FunctionGenerators 10
5.Regulated 3outputPowerSupply5,±15V 10
6.CRO 10
7.StorageOscilloscope 1
8.Bread boards
9.Atleastonedemomoduleeachforthelisted equipments.
10.Componentdatasheetsto beprovided

17153L38	ELECTRICALMACHINES LABORATORY-I	L	T	P	C
		0	0	3	2

OBJECTIVES:

- Toexposethestudentstotheoperationof D.C.machinesandtransformers andgive themexperimentalskill.

LISTOFEXPERIMENTS

1. Opencircuitandloadcharacteristicsof DCshuntgenerator-criticalresistanceandcriticalspeed.
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load testonDCshuntmotor.
4. Load testonDCcompoundmotor.
5. Load testonDCseriesmotor.
6. Swinburne's testandspeedcontrolofDCshuntmotor.
7. Hopkinson'steston DCmotor–generatorset.
8. Load teston single-phase transformerandthreephasetransformers.
9. Open circuitand shortcircuit testson singlephase transformer.
10. Sumpner'steston singlephasetransformers.
11. Separation ofno-loadlosses in singlephasetransformer.
12. Study ofstartersand3-phase transformersconnections.

OUTCOMES: **TOTAL:60 PERIODS**

- Abilityto understandand analyzeDC Generator
- Abilityto understandand analyzeDCMotor
- Abilityto understandand analyseTransformers.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

1. DCShuntMotorwith Loading Arrangement– 3 nos
2. DCShuntMotorCoupled withThreephaseAlternator– 1 No.
3. SinglePhaseTransformer–4 nos
4. DCSeriesMotorwith Loading Arrangement– 1No.
5. DCcompoundMotorwith LoadingArrangement– 1No.
6. ThreePhaseInductionMotorwith Loading Arrangement– 2nos
7. SinglePhaseInductionMotorwith Loading Arrangement– 1No.
8. DCShuntMotorCoupledWithDC CompoundGenerator–2 nos
9. DCShuntMotorCoupledWithDCShuntMotor–1 No.
10. Tachometer-Digital/Analog– 8 nos
11. SinglePhaseAutoTransformer– 2 nos
12. ThreePhaseAutoTransformer– 1 No.
13. SinglePhaseResistiveLoading Bank– 2 nos
14. ThreePhaseResistiveLoading Bank.– 2 nos

17149S41C	NUMERICAL METHODS	L T P	C
		4 0 0	4

OBJECTIVES :

- Tointroducethebasicconceptsof solving algebraicand transcendentalequations.
- Tointroducethenumericaltechniques of interpolationin variousintervalsin real life situations.
- Toacquaintthestudentwithunderstandingofnumericaltechniquesofdifferentiationand integrationwhich playsan important rolein engineeringand technologydisciplines.
- Toacquaint theknowledgeofvarioustechniquesandmethodsofsolving ordinarydifferential equations.
- Tounderstandtheknowledgeofvarioustechniquesandmethodsofsolvingvarioustypesofpartial differentialequations.

UNITI SOLUTIONOFEQUATIONSAND EIGENVALUEPROBLEMS 12

Solutionofalgebraicandtranscendentalequations-Fixedpointiterationmethod–NewtonRaphsonmethod-Solutionoflinearsystemofequations-Gausseliminationmethod–Pivoting-GaussJordanmethod–Iterative methodsofGaussJacobiandGaussSeidel-Eigenvaluesofamatrixby Powermethod and Jacobi'smethod for symmetricmatrices.

UNITII INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals - Lagrange's interpolation – Newton's divided difference interpolation – Cubic Splines - Difference operators and relations - Interpolation with equal intervals - Newton'sforward and backward difference formulae.

UNITIII NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae–EvaluationofdoubleintegralsbyTrapezoidalandSimpson's1/3rules.

UNITIV INITIALVALUE PROBLEMS FORORDINARYDIFFERENTIAL EQUATIONS 12

Singlestepmethods-Taylor'sseriesmethod-Euler'smethod-ModifiedEuler'smethod-Fourthorder Runge-Kuttamethodforsolvingfirstorderequations-Multistepmethods-Milne'sandAdams - Bashforth predictorcorrectormethods for solvingfirstorderequations.

UNITV BOUNDARYVALUEPROBLEMS INORDINARYANDPARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving second order two - point linear boundary value problems - Finite differencetechniquesforthesolutionof twodimensionalLaplace'sandPoisson'sequationson rectangulardomain–Onedimensionalheatflowequationbyexplicitandimplicit(CrankNicholson) methods– Onedimensionalwaveequation byexplicitmethod.

TOTAL: 60 PERIODS

OUTCOMES :

Upon successfulcompletion of thecourse, studentsshould beableto:

- Understandthebasic conceptsandtechniquesofsolving algebraicandtranscendentalequations.
- Appreciatethenumerical techniques of interpolationanderrorapproximations invariousintervals in real life situations.
- Applythenumericaltechniquesofdifferentiationand integrationforengineeringproblems.
- Understandtheknowledgeofvarioustechniquesandmethodsfor solving firstandsecond order ordinarydifferentialequations.
- Solve the partialand ordinarydifferentialequationswithinitialand boundary conditionsbyusing certain techniqueswith engineeringapplications.

TEXTBOOKS :

1. Burden,R.L andFaires,J.D,"NumericalAnalysis",9^{th} Edition,CengageLearning,2016.
2. Grewal,B.S.,andGrewal,J.S.,"NumericalMethodsinEngineeringandScience",Khanna Publishers, 10^{th} Edition,NewDelhi,2015.

REFERENCES:

1. BrianBradie,"AFriendlyIntroductiontoNumericalAnalysis",PearsonEducation,Asia,New Delhi,2007.
2. Gerald.C.F.andWheatley.P.O.,"AppliedNumericalAnalysis",PearsonEducation,Asia, 6^{th} Edition,New Delhi,2006.
3. Mathews,J.H."NumericalMethodsforMathematics,ScienceandEngineering",2^{nd} Edition, Prentice Hall, 1992.
4. SankaraRao. K.,"NumericalMethodsforScientistsandEngineers",PrenticeHallofIndiaPvt. Ltd, 3^{rd} Edition, NewDelhi,2007.
5. Sastry,S.S,"IntroductoryMethodsofNumericalAnalysis",PHILearningPvt.Ltd,5^{th} Edition, 2015.

17153C42 ELECTRICALMACHINES– II L T P C
2 2 0 3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Construction and performance of salient and non – salient type synchronous generators.
- Principleofoperation andperformanceof synchronousmotor.
- Construction,principleofoperation andperformanceof induction machines.
- Startingandspeedcontrolofthree-phaseinduction motors.
- Construction,principleofoperationandperformanceofsinglephaseinduction motors andspecialmachines.

UNITI SYNCHRONOUS GENERATOR 6+6

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance – Armature reaction – Phasor diagrams of non salient pole synchronous generator connectedtoinfinitebus--Synchronizingandparalleloperation–Synchronizingtorque-Changeof excitation and mechanical input- Voltage regulation – EMF, MMF, ZPFandA.S.Amethods– steadystatepower-anglecharacteristics–Tworeactiontheory–slip test-short circuit transients - CapabilityCurves

UNITII SYNCHRONOUS MOTOR 6+6

Principleofoperation–Torqueequation–Operationoninfinitebusbars-VandInvertedVcurves –Powerinputandpowerdevelopedequations–Startingmethods–Currentlocifor constantpower input,constantexcitationandconstantpowerdeveloped-Hunting–naturalfrequencyofoscillations – damperwindings-synchronouscondenser.

UNITIII THREE PHASEINDUCTIONMOTOR 6+6

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling-Equivalentcircuit–Torque-Slipcharacteristics-Conditionformaximumtorque– Losses and efficiency – Load test - No load and blocked rotor tests -Circle diagram –Separationof losses– Doublecageinductionmotors–Inductiongenerators–Synchronousinduction motor.

UNITIV STARTINGANDSPEED CONTROL OFTHREEPHASEINDUCTION MOTOR 6+6

Need forstarting– Types of starters– DOL,Rotorresistance,Autotransformer and Star-delta starters – Speed control – Voltage control, Frequency control and pole changing –Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phaseinductionmotor: Plugging,dynamicbrakingandregenerativebraking.

UNITV SINGLE PHASEINDUCTIONMOTORSANDSPECIALMACHINES 6+6

Constructional details of single phase induction motor – Double field revolving theory and operation–Equivalentcircuit–Noloadandblockedrotortest–Performanceanalysis–Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magneticlevitation systems.

TOTAL: 60 PERIODS

OUTCOMES:

- Abilityto understandtheconstruction and workingprincipleofSynchronous Generator
- Abilityto understandMMFcurvesandarmaturewindings.
- Abilityto acquireknowledgeon Synchronousmotor.
- Abilityto understandtheconstruction and workingprincipleofThreephaseInduction Motor
- Abilityto understandtheconstruction and workingprincipleofSpecialMachines
- Abilitytopredetermine theperformancecharacteristics ofSynchronousMachines.

TEXTBOOKS:

1. A.E.Fitzgerald, CharlesKingsley,Stephen.D. Umans,'ElectricMachinery',McGraw Hillpublishing CompanyLtd, 2003.
2. VincentDelToro, 'BasicElectricMachines'PearsonIndiaEducation, 2016.
3. Stephen J. Chapman, 'Electric MachineryFundamentals'4th edition, McGrawHill Education Pvt.Ltd, 2010.

REFERENCES

1. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing CompanyLtd, 2002.
2. P.S.Bhimbhra, 'ElectricalMachinery', KhannaPublishers,2003.
3. M.N.Bandyopadhyay,ElectricalMachinesTheoryandPractice,PHILearningPVTLTD., NewDelhi,2009.
4. B.R.Gupta,'FundamentalofElectricMachines'NewageInternationalPublishers,3rd Edition ,Reprint2015.
5. Murugesh Kumar, 'ElectricMachines', VikasPublishing HousePvt.Ltd, 2002.
6. Alexander S. Langsdorf, 'Theoryof Alternating-Current Machinery', McGrawHill Publications,2001.

17153C43	TRANSMISSIONAND DISTRIBUTION	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Tostudythestructureofelectricpowersystemandtodevelopexpressionsforthe computation of transmission lineparameters.
- Toobtaintheequivalentcircuitsforthetransmissionlinesbasedondistanceandto determine voltage regulation andefficiency.
- Tounderstandthemechanicaldesign of transmission linesand toanalyze thevoltage distributionin insulatorstrings toimprove theefficiency.
- Tostudythe types,construction ofcabilitysandmethods toimprove theefficiency.
- Tostudyaboutdistributionsystems,typesofsubstations,methodsofgrounding, EHVAC, HVDCand FACTS.

UNITI TRANSMISSIONLINEPARAMETERS 9

StructureofPowerSystem-Parametersofsingleandthreephasetransmissionlineswithsingle and double circuits -Resistance, inductance and capacitance of solid, stranded and bundled conductors, Symmetrical and unsymmetrical spacing and transposition -application of self and mutualGMD;skinandproximityeffects-Typicalconfigurations,conductortypes andelectrical parametersofEHV lines.

UNITII MODELLINGANDPERFORMANCEOFTRANSMISSIONLINES 9

PerformanceofTransmissionlines-shortline,mediumlineandlongline-equivalentcircuits, phasor diagram, attenuation constant, phase constant, surge impedance -transmission efficiencyandvoltageregulation,realandreactivepowerflowinlines-Power Circle diagrams- Formation ofCorona–Critical Voltages– Effecton LinePerformance.

UNITIII MECHANICAL DESIGNOFLINES 9

Mechanical design of OH lines – Line Supports –Types of towers – Stress and Sag Calculation – Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulatorstring,improvementofstring efficiency, testing ofinsulators.

UNITIV UNDER GROUNDCABILITYS 9

Undergroundcabilitys- Typesofcabilitys–Constructionofsinglecoreand3coreCabilitys-InsulationResistance–PotentialGradient-CapacitanceofSingle-coreand3corecabilitys -Grading ofcabilitys- Powerfactorand heating ofcabilitys– DCcabilitys.

UNITV DISTRIBUTIONSYSTEMS 9

Distribution Systems – General Aspects – Kelvin’s Law – AC and DC distributions - TechniquesofVoltageControlandPowerfactorimprovement –DistributionLoss –Typesof Substations-MethodsofGrounding–TrendsinTransmissionandDistribution:EHVAC,HVDC and FACTS(Qualitative treatmentonly).

TOTAL: 45 PERIODS

OUTCOMES:

- Tounderstand theimportanceandthefunctioning oftransmissionlineparameters.
- Tounderstand theconcepts ofLinesandInsulators.
- Toacquire knowledgeon theperformanceofTransmissionlines.
- Toacquire knowledgeon Underground Cabilitys
- Tobecomefamiliarwiththefunctionofdifferentcomponentsusedin Transmission and Distributionlevelsofpowersystemand modellingofthesecomponents.

TEXTBOOKS:

1. D.P.Kothari,I.J. Nagarath,‘Power SystemEngineering’,McGraw-HillPublishing Companylimited,NewDelhi,Second Edition, 2008.
2. C.L.Wadhwa, ‘ElectricalPowerSystems’,NewAcademicScienceLtd, 2009.
3. S.N.Singh,‘ElectricPowerGeneration,TransmissionandDistribution’,PrenticeHallof IndiaPvt.Ltd,NewDelhi, SecondEdition,2011.

REFERENCES

1. B.R.Gupta,‘PowerSystemAnalysisandDesign’S.Chand,NewDelhi,FifthEdition, 2008.
2. Luces M.Fualken berry, Walter Coffer, ‘Electrical Power Distribution and Transmission’, PearsonEducation, 2007.
3. ArunIngole, "powertransmission and distribution"PearsonEducation,2017
4. J.Brian, Hardy and Colin R.Bayliss ‘Transmission and Distribution in Electrical Engineering’,Newnes;Fourth Edition, 2012.
5. G.Ramamurthy, “Handbook of Electrical power Distribution,” Universities Press, 2013.
6. V.K.Mehta,RohitMehta,‘Principlesofpowersystem’,S.Chand&CompanyLtd, New Delhi,2013

17153C44 MEASUREMENTSANDINSTRUMENTATION

L	T	P	C
3	0	0	3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Basicfunctionalelementsof instrumentation
- Fundamentals ofelectricalandelectronicinstruments
- Comparisonbetween variousmeasurement techniques
- Various storageand displaydevices
- Various transducersandthedataacquisition systems

UNITI INTRODUCTION 9

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration-Principle and typesofanalog and digitalvoltmeters, ammeters.

UNITII ELECTRICALANDELECTRONICINSTRUMENTS 9

Principleandtypesofmultimeters–Singleandthreephasewattmetersandenergymeters– Magnetic measurements – Determination of B-H curve and measurements of iron loss –Instrument transformers–Instrumentsformeasurementof frequencyandphase.

UNITIII COMPARATIVEMETHODS OF MEASUREMENTS 9

D.C potentiometers, D.C (Wheat stone, Kelvin and Kelvin Double bridge) &A.C bridges (Maxwell, Anderson and Schering bridges), transformer ratio bridges, self-balancing bridges. Interference &screening – Multiple earth and earth loops - Electrostatic and electromagnetic Interference–Groundingtechniques.

UNITIV STORAGEAND DISPLAYDEVICES 9

Magnetic disk andtape–Recorders, digitalplotters and printers, CRT display, digitalCRO,LED, LCD& Dotmatrix display–DataLoggers.

UNITV TRANSDUCERSANDDATAACQUISITIONSYSTEMS 9

Classification of transducers – Selection of transducers – Resistive, capacitive &inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers – Elements of data acquisitionsystem–Smartsensors-ThermalImagers.

TOTAL: 45 PERIODS

OUTCOMES:

- Toacquire knowledgeon Basicfunctionalelementsofinstrumentation
- Tounderstand theconcepts ofFundamentalsofelectricalandelectronicinstruments
- Abilityto comparebetweenvariousmeasurementtechniques
- Toacquire knowledgeon Variousstorageand display devices
- Tounderstand theconcepts Varioustransducersand thedataacquisitionsystems
- Abilityto modelandanalyzeelectricalandelectronicInstrumentsandunderstandthe operationalfeaturesofdisplayDevicesand DataAcquisition System.

TEXTBOOKS:
1. A.K.Sawhney,‘A Course in Electrical&ElectronicMeasurements&Instrumentation’, DhanpatRaiandCo,2010.
2. J.B. Gupta, ‘A CourseinElectronicandElectricalMeasurements’, S.K.Kataria&Sons,Delhi, 2013.
3. Doebelin E.O. andManikD.N.,MeasurementSystems–ApplicationsandDesign, Special Indian Edition, McGrawHillEducation Pvt.Ltd.,2007.

REFERENCES
1. H.S. Kalsi,‘Electronic Instrumentation’,McGrawHill,IIIEdition 2010.
2. D.V.S. Murthy,‘TransducersandInstrumentation’, PrenticeHallofIndiaPvtLtd, 2015.
3. David Bell, ‘ElectronicInstrumentation &Measurements’, Oxford UniversityPress,2013.
4. Martin Reissland, ‘ElectricalMeasurements’, NewAgeInternational(P)Ltd.,Delhi,2001.
5. Alan.S. Morris, PrinciplesofMeasurementsandInstrumentation, 2nd Edition, PrenticeHallofIndia, 2003.

17153C45	LINEARINTEGRATEDCIRCUITSANDAPPLICATIONS	L	T	P	C
		3	0	0	3

OBJECTIVES:

Toimpartknowledgeon the following topics

- SignalanalysisusingOp-amp based circuits.
- ApplicationsofOp-amp.
- FunctionalblocksandtheapplicationsofspecialICslikeTimers,PLLcircuits,regulator Circuits.
- ICfabrication procedure.

UNITI ICFABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETsandPVCell.

UNITII CHARACTERISTICS OFOPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting Amplifiers,summer, differentiatorandintegrator-V/I&I/Vconverters.

UNITIII APPLICATIONS OF OPAMP 9

Instrumentation amplifier and its applications for transducer Bridge, Log and Antilog Amplifiers- Analogmultiplier& Divider,firstandsecondorderactivefilters,comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2Rladderandweightedresistor types),A/Dconvertersusingopamps.

UNITIV SPECIAL ICs 9

Functionalblock,characteristicsof555TimeranditsPWMapplication-IC-566voltage controlled oscillatorIC;565-phase lockedloop IC, AD633Analog multiplierICs.

UNITV APPLICATIONICs 9

AD623 Instrumentation Amplifier and its application as load cell weight measurement - IC voltageregulators–LM78XX,LM79XX;FixedvoltageregulatorsitsapplicationasLinearpower supply-LM317,723Variabilityvoltageregulators,switchingregulator-SMPS- ICL 8038functiongeneratorIC.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto acquireknowledge in ICfabrication procedure
- Abilityto analyze thecharacteristicsofOp-Amp
- Tounderstand theimportanceofSignalanalysisusingOp-amp based circuits.
- Functional blocks andthe applications of special ICs likeTimers, PLL circuits, regulator Circuits.
- Tounderstand andacquireknowledgeon the ApplicationsofOp-amp
- Abilitytounderstandandanalyse,linearintegratedcircuitstheirFabricationand Application.

TEXTBOOKS:

1. David A.Bell, ‘Op-amp & LinearICs’, Oxford,2013.

2. D.RoyChoudhary,SheilB. Jani, ‘LinearIntegrated Circuits’, IIedition, NewAge, 2003.

3. RamakantA.Gayakward, ‘Op-ampsandLinearIntegratedCircuits’,IVedition, Pearson Education,2003/PHI. 2000.

REFERENCES

1. Fiore,”Opamps&LinearIntegrated CircuitsConcepts&applications”,Cengage, 2010.

2. Floyd ,Buchla,”FundamentalsofAnalog Circuits,Pearson, 2013.

3. Jacob Millman, Christos C.Halkias, ‘Integrated Electronics - Analog and Digital circuits system’, McGraw Hill, 2003.

4. RobertF.Coughlin,FredrickF. Driscoll, ‘Op-amp andLinearICs’,Pearson,6th edition,2012.

5. Sergio Franco, ‘Design with OperationalAmplifiersand Analog Integrated Circuits’,Mc GrawHill,2016.

6. MuhammadH.Rashid,’MicroelectronicCircuitsAnalysisandDesign’ Cengage Learning,2011.

17153C46 CONTROLSYSTEMS LTPC
3204

COURSE OBJECTIVES

- Tounderstand theuseoftransfer function modelsforanalysisphysical systemsand introducethecontrolsystemcomponents.
- Toprovideadequateknowledge in thetime responseofsystemsand steadystate erroranalysis.
- Toaccordbasicknowledgein obtainingtheopenloopandclosed–loopfrequency responsesof systems.
- Tointroducestability analysisanddesign ofcompensators

UNITI SYSTEMSAND REPRESENTATION 9

Basic elements in control systems: – Open and closed loop systems – Electrical analogy of mechanicalandthermalsystems–Transferfunction–ACandDCservomotors–Blockdiagramreduction techniques–Signalflowgraphs.

UNITII TIME RESPONSE 9

Timeresponse:–Timedomainspecifications–Typesoftestinput–IandIIordersystemresponse–Error coefficients–Generalizederrorseries–Steadystateerror–Rootlocusconstruction-EffectsofP,PI,PID modesof feedbackcontrol–Time responseanalysis.

UNITIII FREQUENCYRESPONSE 9

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from openloop response-Correlation betweenfrequencydomain andtimedomainspecifications

UNITIV STABILITYAND COMPENSATOR DESIGN 9

Characteristicsequation–RouthHurwitzcriterion–Nyquiststabilitycriterion-Performancecriteria–Effect of Lag, lead and lag-lead compensation on frequency response-Design of Lag, lead and lag- lead compensatorusingbodeplots.

UNITV STATEVARIABLEANALYSIS 9

Concept of state variables – State models for linear and time invariant Systems – Solution of stateand outputequation in controllablecanonicalform– Conceptsofcontrollabilityandobservability.

TOTAL(L:45+T:30):75PERIODS

COURSEOUTCOMES

Attheend ofthecourse,the studentshould have the:

- Abilityto develop variousrepresentationsofsystembasedon theknowledgeof
- Mathematics, ScienceandEngineeringfundamentals.
- Abilityto do timedomain and frequencydomain analysisofvariousmodelsoflinearsystem.
- Abilityto interpretcharacteristics ofthesystemto develop mathematicalmodel.
- Abilityto design appropriatecompensatorfor thegivenspecifications.
- Abilityto comeoutwith solutionforcomplex controlproblem.
- Abilityto understanduseofPIDcontroller in closed loop system.

TEXTBOOKS

1. Nagarath, I.J.andGopal,M., "ControlSystemsEngineering", NewAgeInternational Publishers, 2017.
2. Benjamin C.Kuo, "AutomaticControlSystems",Wiley,2014.

REFERENCES

1. KatsuhikoOgata, "Modern ControlEngineering",Pearson, 2015.
2. Richard C.DorfandBishop,R.H., "Modern ControlSystems",Pearson Education,2009.
3. JohnJ.D.,AzzoConstantine,H. and HoupisSttuart,NSheldon, "LinearControlSystem AnalysisandDesign withMATLAB",CRCTaylor&FrancisReprint2009.
4. Rames C.Panda and T. Thyagarajan, "An Introduction to Process Modelling Identification andControlofEngineers",NarosaPublishing House, 2017.
5. M.Gopal,"ControlSystem:Principleanddesign", McGrawHillEducation,2012.
6. NPTELVideoLectureNoteson "ControlEngineering"byProf. S. D. Agashe,IIT Bombay.

17153L47	ELECTRICALMACHINES LABORATORY- II	L	T	P	C
		0	0	3	2

OBJECTIVES:

- Toexpose thestudentstotheoperation of synchronousmachinesandinduction motors andgive themexperimentalskill.

LISTOFEXPERIMENTS

1. Regulation of threephasealternatorbyEMF andMMFmethods.
2. Regulation ofthreephasealternatorbyZPFandASAmethods.
3. Regulation of threephasesalientpolealternatorby slip test.
4. Measurementsofnegative sequenceandzero sequenceimpedanceofalternators.
5. Vand Inverted VcurvesofThreePhaseSynchronousMotor.
6. Load testonthree-phaseinductionmotor.
7. No load and blocked rotor tests on three-phase induction motor (Determination of equivalentcircuitparameters).
8. Separation ofNo-loadlossesof three-phase inductionmotor.
9. Load teston single-phaseinductionmotor.
10. No load andblocked rotortestonsingle-phase inductionmotor.
11. Study ofInduction motorStarters

TOTAL:60 PERIODS

OUTCOMES:

Attheend ofthecourse,the studentshould have the:

- Abilityto understandand analyzeEMF andMMFmethods
- Abilitytoanalyze thecharacteristicsofVandInverted V curves
- Abilitytounderstand theimportanceofSynchronous machines
- Abilityto understandtheimportanceof InductionMachines
- Abilityto acquireknowledgeon separation of losses

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

1. SynchronousInductionmotor3HP –1 No.
2. DCShuntMotorCoupledWithThreephaseAlternator– 4 nos
3. DCShuntMotorCoupledWithThreephase Slip ring Inductionmotor– 1No.
4. ThreePhaseInductionMotorwith Loading Arrangement– 2nos
5. SinglePhaseInductionMotorwith Loading Arrangement– 2nos
6. Tachometer-Digital/Analog– 8 nos
7. SinglePhaseAutoTransformer– 2 nos
8. ThreePhaseAutoTransformer– 3 nos
9. SinglePhaseResistiveLoading Bank– 2 nos
10. ThreePhaseResistiveLoading Bank – 2 nos
11. CapacitorBank– 1No.

17153L48	LINEARAND DIGITALINTEGRATED CIRCUITS LABORATORY	L T P C 0 0 3 2

OBJECTIVES:

- Tolearn design, testingandcharacterizing ofcircuitbehaviorwith digitaland analog ICs.

LISTOFEXPERIMENTS

1. Implementation ofBooleanFunctions,Adderand Subtractorcircuits.
2. Code converters:Excess-3 to BCDandBinarytoGraycodeconverterand vice-versa
3. Paritygeneratorandparitychecking
4. EncodersandDecoders
5. Counters: Design and implementation of 3-bit modulo counters as synchronous and Asynchronous typesusingFF IC'sand specificcounterIC.
6. ShiftRegisters:Designandimplementationof4-bitshiftregistersinSISO,SIPO,PISO, PIPO modesusing suitabilityIC's.
7. Study ofmultiplexeranddemultiplexer
8. TimerICapplication:StudyofNE/SE 555timerin Astability,Monostability operation.
9. Application of Op-Amp: inverting and non-inverting amplifier, Adder, comparator, IntegratorandDifferentiator.
10. VoltagetofrequencycharacteristicsofNE/SE566 IC.
11. VariabilityVoltageRegulatorusing IC LM317.

TOTAL:60 PERIODS

OUTCOMES:

Attheend ofthecourse,the studentshould have the:

- Abilityto understandandimplementBoolean Functions.
- Abilityto understandtheimportanceofcodeconversion
- AbilitytoDesign andimplement4-bitshift registers
- Abilityto acquireknowledgeon Application ofOp-Amp
- AbilitytoDesign andimplementcountersusing specificcounterIC.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:(3 perBatch)

S.No	Nameoftheequipments/Components	QuantityRequired	Remarks
1	Dual,(0-30V)variabilityPowerSupply	10	-
2	CRO	9	30MHz
3	DigitalMultimeter	10	Digital
4	FunctionGenerator	8	1MHz
5	ICTester(Analog)	2	
6	Bread board	10	

7	Computer (PSPICE installed)	1	
Consumabilitys (sufficientquantity)			
1	IC741/ICNE555/566/565		
2	DigitalICtypes		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 /SG3525		
7	Transistor–2N3391		
8	Diodes, IN4001,BY126		
9	Zenerdiodes		
10	Potentiometer		
11	Step-down transformer230V/12-0-12V		
12	Capacitor		
13	Resistors1/4WattAssorted		
14	SingleStrandWire		

17153C51 **POWER SYSTEMANALYSIS** **L T P C**
3 0 0 3

OBJECTIVES:

- Tomodelthepower systemundersteadystateoperating condition
- Tounderstand andapplyiterative techniquesforpowerflowanalysis
- Tomodelandcarryoutshortcircuit studiesonpowersystem
- Tomodelandanalyze stabilityproblems in powersystem

UNITI POWERSYSTEM 9

Needforsystem planningandoperationalstudies- PowerscenarioinIndia- Powersystem components– Representation-Singlelinediagram-perunitquantities-p.u.impedancediagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off-nominaltransformer- Formation ofbusadmittancematrix of largepowernetwork.

UNITII POWERFLOWANALYSIS 9

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution byNewton Raphsonmethod**.**

UNITIII SYMMETRICALFAULTANALYSIS 9

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem- BusImpedancematrixbuildingalgorithm(withoutmutualcoupling)-Symmetrical fault analysisthroughbusimpedancematrix-Postfaultbusvoltages-Faultlevel-Currentlimiting reactors.

UNITIV UNSYMMETRICALFAULTANALYSIS 9

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetricalfaultsatgeneratorterminals:LG,LLandLLG-unsymmetricalfaultoccurringat any pointin a power system - computation of post fault currents in symmetrical component and phasordomains.

UNITV STABILITYANALYSIS 9

Classificationofpowersystemstability–Rotoranglestability-Swingequation-Swing curve- Power-Angle equation - Equalareacriterion -Critical clearing angle andtime -Classicalstep- by-step solution oftheswing equation – modified Eulermethod.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto modelthepowersystemundersteady stateoperatingcondition
- Abilityto understandand applyiterative techniquesforpowerflowanalysis
- Abilityto modelandcarryoutshortcircuitstudieson power system
- Abilityto modelandanalyze stabilityproblems inpower system
- Abilityto acquireknowledgeon Faultanalysis.
- Abilitytomodelandunderstandvariouspower systemcomponentsand carryoutpower flow,shortcircuitand stabilitystudies.

TEXTBOOKS:

1. JohnJ.Grainger,WilliamD.Stevenson,Jr,‘PowerSystemAnalysis’,McGrawHill Education (India)PrivateLimited,New Delhi,2015.
2. Kothari D.P. and Nagrath I.J., ‘Power System Engineering’, Tata McGraw-Hill Education, SecondEdition, 2008.
3. HadiSaadat,‘PowerSystemAnalysis’,TataMcGrawHillEducationPvt.Ltd.,New Delhi,21streprint, 2010.

REFERENCES

1. PaiMA,‘ComputerTechniquesinPower SystemAnalysis’,TataMcGraw-Hill Publishing Company Ltd., NewDelhi,SecondEdition,2007.
2. J.DuncanGlover,MulukutlaS.Sarma,ThomasJ.Overbye,‘PowerSystemAnalysis &Design’, CengageLearning,Fifth Edition,2012.
3. GuptaB.R., ‘PowerSystem- AnalysisandDesign’,S.ChandPublishing, 2001.
4. KundurP.,‘PowerSystemStabilityandControl’,TataMcGrawHillEducationPvt. Ltd.,NewDelhi,10th reprint, 2010.

17153C52	MICROPROCESSORSANDMICROCONTROLLERS	L	T	P	C
		3	0	0	3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- ArchitectureofµP8085&µC8051
- Addressingmodes&instructionsetof8085 &8051.
- Need &useofInterruptstructure8085 &8051.
- Simpleapplicationsdevelopmentwith programming8085 &8051

UNITI 8085 PROCESSOR 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization – I/Oportsanddatatransferconcepts–Timing Diagram–Interrupts.

UNITII PROGRAMMING OF 8085 PROCESSOR 9

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation&controlinstructions–Programming:Loopstructurewithcounting&Indexing–Look up tability-Subroutine instructions-stack.

UNITIII 8051 MICRO CONTROLLER 9

Hardware Architecture, pinouts – Functional Building Blocks of Processor – Memory organization–I/Oportsanddatatransferconcepts–TimingDiagram–Interrupts-Data Transfer, Manipulation,ControlAlgorithms&I/Oinstructions,ComparisontoProgrammingconceptswith 8085.

UNITIV PERIPHERALINTERFACING 9

Studyonneed,Architecture,configurationandinterfacing,withICs:8255,8259,8254, 8279,-A/DandD/Aconverters&Interfacingwith 8085&8051.

UNITV MICROCONTROLLERPROGRAMMING&APPLICATIONS 9

Simpleprogrammingexercises-keyboardanddisplayinterface–Controlofservomotor-stepper motorcontrol-Applicationto automationsystems.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto acquireknowledge in Addressing modes& instruction setof8085&8051.
- Abilitytoneed &useofInterruptstructure8085&8051.
- Abilityto understandtheimportanceofInterfacing
- Abilityto explain thearchitecture ofMicroprocessorand Microcontroller.
- Abilityto writetheassemblylanguageprogramme.
- Abilityto develop theMicroprocessorandMicrocontrollerbased applications.

TEXTBOOKS:

1. Sunil Mathur &Jeebananda Panda, "Microprocessor and Microcontrollers", PHI LearningPvt.Ltd, 2016.
2. R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', with 8085,WileyEastern Ltd., NewDelhi,2013.
3. MuhammadAliMazidi&JaniceGilliMazidi,R.D.Kinely'The8051MicroController andEmbedded Systems',PHIPearsonEducation,5th Indian reprint,2003.

REFERENCES

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, PrenticeHallofIndia,NewDelhi,2007.
2. B.RAM," Computer Fundamentals Architecture and Organization" New age InternationalPrivateLimited, Fifthedition, 2017.
3. SoumitraKumarMandal, Microprocessor&MicrocontrollerArchitecture, Programming &Interfacingusing8085,8086,8051,McGrawHillEdu,2013.
4. AjayV.Deshmukh,'MicrocontrollerTheory&Applications',McGrawHillEdu,2016
5. DouglasV.Hall, 'Microprocessorand Interfacing', McGrawHillEdu,2016.

17153C53	POWER ELECTRONICS	L T P C
		3 0 0 3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Differenttypesofpower semiconductordevicesand their switching
- Operation, characteristicsand performanceparametersofcontrolled rectifiers
- Operation, switching techniques and basics topologies of DC-DC switching regulators.
- Different modulation techniques of pulse width modulated inverters and to understandharmonicreductionmethods.
- Operation ofACvoltagecontrollerandvariousconfigurations.

UNITI POWERSEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT- Static characteristics: SCR, MOSFET and IGBT - Triggering and commutation circuit for SCR-IntroductiontoDriverandsnubbercircuits.

UNITII PHASE-CONTROLLEDCONVERTERS 9

2-pulse, 3-pulse and 6-pulseconverters– performance parameters –Effect of source inductance— Firing Schemes for converter–Dual converters, Applications-light dimmer, Excitation system, SolarPVsystems.

UNITIII DCTODC CONVERTERS 9

Step-downandstep-upchopper-controlstrategy–Introductiontotypesofchoppers-A,B,C,Dand E - Switched mode regulators- Buck, Boost, Buck- Boost regulator, Introduction toResonant Converters,Applications-Batteryoperated vehicles.

UNITIV INVERTERS 9

Single phase and three phase voltage source inverters (both120^0 mode and 180^0 mode)– Voltage&harmoniccontrol--PWMtechniques:MultiplePWM,SinusoidalPWM,modified sinusoidal PWM – Introduction to space vector modulation –Current source inverter, Applications-Induction heating,UPS.

UNITV ACTOAC CONVERTERS 9

Single phaseandThreephaseACvoltagecontrollers–Controlstrategy-PowerFactorControl –Multistagesequencecontrol -single phase and three phase cyclo converters – IntroductiontoMatrixconverters, Applications–welding.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto analyseAC-ACandDC-DCandDC-ACconverters.
- Abilityto choosetheconvertersfor real timeapplications.

TEXTBOOKS:

1. M.H. Rashid, ‘Power Electronics: Circuits, Devices and Applications’, Pearson Education,Third Edition, NewDelhi,2004.
2. P.S.Bimbra“PowerElectronics” KhannaPublishers,thirdEdition, 2003.
3. Ashfaq Ahmed ‘Power Electronics for Technology’, Pearson Education, Indian reprint,2003.

REFERENCES

1. JosephVithayathil,’PowerElectronics,PrinciplesandApplications’,McGrawHill Series,6th Reprint, 2013.
2. Philip T. Krein, “Elements of Power Electronics” Oxford University Press, 2004 Edition.
3. L.Umanand, “PowerElectronicsEssentialsandApplications”,Wiley,2010.
4. Ned Mohan Tore. M. Undel and, William. P. Robbins, ‘Power Electronics: Converters, Applications and Design’,JohnWileyand sons,third edition,2003.
5. S.RamaReddy,‘FundamentalsofPowerElectronics’, NarosaPublications,2014.
6. M.D.Singh andK.B. Khanchandani,“PowerElectronics,”McGraw HillIndia,2013.
7. JP Agarwal,”PowerElectronicSystems:Theory andDesign”1e,PearsonEducation, 2002.

17153C55	DIGITALSIGNALPROCESSING	L	T	P	C
		2	2	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Signalsandsystems&theirmathematicalrepresentation.
- Discretetime systems.
- Transformation techniques&theircomputation.
- Filtersandtheirdesignfordigitalimplementation.
- Programmabilitydigitalsignalprocessor&quantization effects.

UNITI INTRODUCTION 6+6

Classificationofsystems: Continuous,discrete,linear,causal,stability, dynamic,recursive,time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization,quantizationerror, Nyquist rate, aliasing effect.

UNITII DISCRETE TIMESYSTEMANALYSIS 6+6

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z- transform, application to discrete systems - Stability analysis, frequency response – Convolution – DiscreteTimeFouriertransform,magnitudeandphaserepresentation.

UNITIII DISCRETE FOURIERTRANSFORM&COMPUTATION 6+6

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT &DIF using radix 2 FFT – Butterfly structure.

UNITIV DESIGNOFDIGITALFILTERS 6+6

FIR&IIRfilterrealization–Parallel&cascadeforms.FIRdesign: Windowing Techniques–Need and choice of windows – Linear phase characteristics. Analog filter design –Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariantandbilinear transformationWarping,prewarping.

UNITV DIGITAL SIGNALPROCESSORS 6+6

Introduction – Architecture – Features – Addressing Formats – Functional modes - IntroductiontoCommercial rocessors.

TOTAL: 60 PERIODS

OUTCOMES:

1. Abilityto understand theimportanceofFourier transform, digitalfiltersandDS Processors.
2. Abilityto acquireknowledgeon Signalsandsystems&theirmathematical representation.
3. Abilityto understandand analyze the discretetime systems.
4. Abilityto analyze the transformationtechniques&theircomputation.
5. Abilityto understand thetypesoffiltersandtheirdesign fordigitalimplementation.
6. Abilityto acquireknowledgeon programmabilitydigitalsignalprocessor&quantization effects.

TEXTBOOKS:

1. J.G.ProakisandD.G.Manolakis,‘DigitalSignalProcessingPrinciples,Algorithms andApplications’, Pearson Education, New Delhi,PHI.2003.

2. S.K.Mitra,'DigitalSignalProcessing–AComputerBasedApproach', McGrawHill Edu, 2013.
3. LonnieC.Ludeman,"FundamentalsofDigitalSignalProcessing",Wiley,2013

REFERENCES

1. PoornaChandraS, Sasikala. B,DigitalSignalProcessing,VijayNicole/TMH,2013.
2. RobertSchilling&SandraL.Harris,IntroductiontoDigitalSignalProcessingusing Matlab",CengageLearning,2014.
3. B.P.Lathi,'PrinciplesofSignalProcessingandLinearSystems',OxfordUniversityPress, 2010 3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing withMatLab', CRCPress, 2009.
4. SenM.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture, Implementations& Applications, Pearson,2013
5. DimitrisG.Manolakis, VinayK.Ingle, applied DigitalSignal Processing,Cambridge,2012

17153C56	OBJECT ORIENTEDPROGRAMMING	LTPC 30 0 3

OBJECTIVES:

- Tounderstand Object Oriented Programmingconceptsandbasiccharacteristicsof Java
- Toknowtheprinciplesofpackages, inheritance andinterfaces
- Todefineexceptionsand useI/Ostreams
- Todevelop ajavaapplication with threadsandgenericsclasses
- Todesign andbuild simpleGraphicalUserInterfaces

UNITI INTRODUCTIONTOOOPAND JAVAFUNDAMENTALS 10

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism-OOPin Java–CharacteristicsofJava–TheJavaEnvironment- JavaSourceFile -Structure–Compilation. FundamentalProgrammingStructuresinJava–DefiningclassesinJava –constructors,methods-access specifiers-staticmembers-Comments,DataTypes,Variables,Operators, ControlFlow,Arrays,Packages-JavaDoccomments.

UNITII INHERITANCEANDINTERFACES 9

Inheritance–Superclasses-subclasses–Protectedmembers–constructorsinsubclasses-theObjectclass –abstractclassesandmethods-finalmethodsandclasses–Interfaces–definingan interface, implementing interface, differences between classes and interfaces and extendinginterfaces-Objectcloning-inner classes,ArrayLists-Strings

UNITIII EXCEPTIONHANDLINGANDI/O 9

Exceptions-exceptionhierarchy-throwingandcatchingexceptions–built-inexceptions,creatingown exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams andCharacter streams–Reading andWritingConsole– ReadingandWritingFiles

UNITIV MULTITHREADINGAND GENERICPROGRAMMING 8

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming–Genericclasses– genericmethods– BoundedTypes– RestrictionsandLimitations.

UNITV EVENT DRIVENPROGRAMMING 9

Graphicsprogramming-Frame–Components-workingwith2Dshapes-Usingcolor,fonts,and images- Basics of event handling - event handlers - adapter classes - actions - mouse events -AWT event hierarchy-IntroductiontoSwing–layout management-SwingComponents–Text Fields,TextAreas– Buttons-CheckBoxes–RadioButtons–Lists-choices-Scrollbars–Windows
–Menus– Dialog Boxes.

TOTAL:45 PERIODS

COURSEOUTCOMES:

Upon completion ofthecourse, studentswillbeableto:

- Develop JavaprogramsusingOOPprinciples
- Develop Javaprogramswith theconceptsinheritanceandinterfaces
- BuildJavaapplicationsusing exceptionsandI/Ostreams
- Develop Javaapplicationswith threadsandgenericsclasses
- Developinteractive Javaprogramsusing swings

TEXTBOOKS

1. HerbertSchildt, “JavaThecomplete reference”,8th Edition, McGraw HillEducation,2011.
2. CayS.Horstmann,Garycornell,“CoreJavaVolume–IFundamentals”,9th Edition,Prentice Hall, 2013.

REFERENCES

1. PaulDeitel,HarveyDeitel, “JavaSE 8forprogrammers”,3rd Edition, Pearson,2015.
2. Steven Holzner,“Java2Blackbook”,Dreamtech press, 2011.
3. TimothyBudd,“UnderstandingObject-orientedprogrammingwithJava”,UpdatedEdition, Pearson Education, 2000.

17153L57 CONTROLAND INSTRUMENTATIONLABORATORY

L	T	P	C
0	0	3	2

OBJECTIVES:

- Toprovideknowledgeon analysisand design ofcontrolsystemalongwith basicsof instrumentation.

LISTOFEXPERIMENTS

CONTROLSYSTEMS:

1. P,PIand PIDcontrollers
2. StabilityAnalysis
3. Modeling ofSystems– Machines, SensorsandTransducers
4. Design ofLag,Leadand Lag-Lead Compensators
5. Position ControlSystems
6. Synchro-Transmitter-Receiverand Characteristics
7. Simulation ofControlSystemsbyMathematicaldevelopmenttools.

INSTRUMENTATION:

8. BridgeNetworks–ACandDC Bridges
9. DynamicsofSensors/Transducers

   (a)Temperature (b)pressure (c)Displacement (d) Optical(e)Strain (f)Flow

10 PowerandEnergyMeasurement

11 Signal Conditioning

   (a)InstrumentationAmplifier

   (b)Analog – DigitalandDigital–Analogconverters (ADCandDACs)

12 ProcessSimulation

TOTAL:60 PERIODS

OUTCOMES:

- Abilityto understandcontroltheory andapplythemto electrical engineeringproblems.
- Abilitytoanalyze thevarious typesofconverters.
- Abilitytodesigncompensators
- Abilitytounderstand thebasicconceptsofbridge networks.
- Abilityto thebasicsofsignalconditioningcircuits.
- Abilitytostudythesimulation packages.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

CONTROLSYSTEMS:

1. PIDcontrollersimulation andlearnerkit– 1No.
2. Digital storageOscilloscopeforcapturingtransience-1 No

   2PersonalComputer with controlsystem

   simulation packages-10 Nos

3. DCmotor–Generatortestset-upfor evaluationofmotorparameters
4. CRO30MHz–1 No.
5. 2MHzFunctionGenerator– 1No.
6. Position ControlSystemsKit(with manual)–1No.,Tacho GeneratorCoupling set
7. ACSynchro transmitter&receiver–1No.
8. SufficientnumberofDigitalmultimeters, speedand torque sensors

INSTRUMENTATION:

9. R,L, CBridgekit (with manual)
10. a)Electricheater– 1No.
    Thermometer–1No.Thermistor(silicon type)RTDnickeltype– 1No.

    b)30psiPressurechamber(completeset)–1No.Currentgenerator(0–20mA)Air foot pump – 1 No. (withnecessaryconnectingtubes)

    c)LVDT20mmcorelengthmovabilitytype–1No. CRO30MHz– 1No. d)

    Opticalsensor–1No. Lightsource

    e)StrainGauge Kitwith Handyleverbeam–1No.

100gmweights–10 nos
f) FlowmeasurementTrainerkit– 1 No.
(1/2HP Motor,Watertank,DigitalMilliammeter, completeset)

11. SinglephaseAuto transformer– 1No.Watt-hourmeter (energymeter)– 1No.Ammeter VoltmeterRheostatStopwatch
Connectingwires (3/20)
12. ICTransistorkit– 1No.
13. InstrumentationAmplifierkit-1 No
14. Analog – DigitalandDigital–Analogconverters (ADCandDACs)-1 No

17153L58 **OBJECT ORIENTEDPROGRAMMING LABORATORY** **LTPC 00 3 2**

COURSE OBJECTIVES

- Tobuild softwaredevelopmentskillsusingjavaprogramming for real-world applications.
- To understandandapplytheconceptsof classes, packages, interfaces, arraylist,exception handling andfileprocessing.
- Todevelop applicationsusinggenericprogramming andeventhandling.

First100units - Rs.2perunit
101- **Listofexperiments**

1. Develop a Java application to generate Electricity bill. Create a class with the following members:Consumerno.,consumername,previousmonthreading,currentmonthreading,typeofEB connection(i.edomesticorcommercial). Compute thebillamountusingthe following tariff. Ifthe typeof theEBconnection isdomestic,calculate theamount tobepaid asfollows:
   - First100units - Rs.1perunit
   - 101-200units -Rs. 2.50 perunit
   - 201-500units-Rs. 4perunit
   - >501 units - Rs.6 perunit

   Ifthe type of theEBconnectioniscommercial, calculate theamount to bepaid as follows:
   - 200units -Rs. 4.50 perunit
   - 201-500units-Rs. 6perunit
   - >501 units - Rs.7 perunit
2. Developa javaapplicationtoimplementcurrency converter(DollartoINR,EUROtoINR,Yento INRandviceversa),distanceconverter(metertoKM,milestoKMandviceversa),time converter(hoursto minutes,secondsandviceversa)usingpackages.
3. DevelopajavaapplicationwithEmployeeclasswithEmp_name,Emp_id,Address,Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate ProfessorandProfessorfromemployeeclass.AddBasicPay(BP)asthememberofallthe inheritedclasseswith97%ofBPasDA,10%ofBPasHRA,12%ofBPasPF,0.1%ofBPfor staffclub fund. Generatepay slipsfortheemployeeswith theirgrossandnetsalary.
4. Design aJava interfaceforADTStack. Implement this interfaceusing array.Providenecessaryexception handling in both theimplementations.
5. Writea programto performstringoperationsusingArrayList.Writefunctionsforthefollowing

   a.Append-addatend
   b.Insert–addatparticularindex c.
   Search
   d.Listallstring startswithgiven letter

6. WriteaJavaProgramtocreateanabstractclassnamedShapethatcontainstwointegersandan empty method named print Area(). Provide three classes named Rectangle, Triangle andCircle such that eachoneoftheclassesextendstheclassShape.Eachoneoftheclasses containsonlythemethod print Area()thatprintsthearea ofthegiven shape.

7. Write aJavaprogramtoimplementuser definedexceptionhandling.

8. WriteaJavaprogramthatreadsafilenamefromtheuser,displaysinformationaboutwhetherthefile exists,whetherthefileisreadable,orwritable,thetypeoffileandthelengthofthe filein bytes.

9. Writeajavaprogramthatimplementsamulti-threadedapplicationthathasthreethreads.First thread generates a random integer every 1 second and if the value is even, second threadcomputesthe squareofthenumberandprints.Ifthevalueisodd,thethirdthreadwillprintthevalueofcubeof the number.

10.Writeajavaprogram tofindthemaximumvaluefrom thegiventypeofelementsusingageneric function.

11.Design acalculatorusingevent-driven programmingparadigmofJavawith thefollowing options.

a)Decimalmanipulations b)
Scientificmanipulations

12.Develop aminiprojectforanyapplication using Javaconcepts.

COURSEOUTCOMES **TOTAL:60 PERIODS**

Upon completion ofthecourse, thestudentswillbeable to
- Develop andimplementJava programs forsimpleapplications thatmakeuseofclasses, packagesandinterfaces.
- Develop andimplementJavaprogramswith arraylist, exception handlingandmultithreading.
- Design applicationsusingfileprocessing,genericprogrammingandeventhandling.

17153L59 PROFESSIONAL COMMUNICATION LTPC
00 2 1

OBJECTIVES:Thecourseaimsto:

- Enhance theEmployabilityandCareerSkillsofstudents
- Orientthe studentstowardsgroomingasaprofessional
- Make them Employability Graduates
- Develop theirconfidenceandhelp themattendinterviewssuccessfully.

UNITI
IntroductiontoSoftSkills--Hardskills&softskills-employabilityandcareerSkills—Groomingasa professionalwith values—TimeManagement—General awarenessofCurrentAffairs

UNITII
Self-Introduction-organizingthematerial-Introducingoneselftotheaudience– introducingthe topic–answeringquestions–individualpresentationpractice—presentingthevisualseffectively–
5 minutepresentations

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

UNITIV
Interviewetiquette–dresscode–bodylanguage–attendingjobinterviews–telephone/skype interview
-one to oneinterview&panelinterview– FAQs relatedtojob interviews

UNITV
Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long- term careerplan-makingcareerchanges.

TOTAL:30 PERIODS

OUTCOMES:AttheendofthecourseLearnerswillbeabilityto:

- Makeeffectivepresentations
- Participateconfidentlyin Group Discussions.
- Attendjobinterviewsandbe successfulin them.
- Develop adequateSoftSkills requiredfor theworkplace

Recommended Software

1. **Globearena**
2. **Win English**

REFERENCES:

1. Butterfield, Jeff **SoftSkillsforEveryone.**CengageLearning:NewDelhi,2015
2. **Interact** English LabManualforUndergraduateStudents,. OrientBalckSwan:Hyderabad, 2016.
3. E.SureshKumaret al.**CommunicationforProfessionalSuccess.**OrientBlackswan: Hyderabad,2015
4. Raman,MeenakshiandSangeetaSharma.**ProfessionalCommunication**. Oxford University Press:Oxford, 2014
5. S.Hariharanetal. **SoftSkills**. MJP Publishers:Chennai,2010.

SOLIDSTATE DRIVES

17153C61

L	T	P	C
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OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Steadystateoperation and transientdynamicsofamotorload system.
- Analyze theoperation of theconverter/chopperfed dc drive,bothqualitativelyand quantitatively.
- Operation and performanceofACmotordrives.
- AnalyzeanddesignthecurrentandspeedcontrollersforaclosedloopsolidstateDCmotordrive.

UNITI DRIVE CHARACTERISTICS **9**

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics:acceleration,deceleration,starting&stopping–typicalloadtorquecharacteristics–Selection ofmotor.

UNITII CONVERTER/CHOPPERFED DCMOTOR DRIVE **9**

Steadystateanalysisofthesingleandthreephaseconverterfed separatelyexcitedDCmotordrive– continuous conduction –Time ratio and current limitcontrol– 4quadrantoperation ofconverter/chopperfed drive-Applications.

UNITIII INDUCTION MOTORDRIVES **9**

Stator voltage control–V/f control– Rotor Resistance control-qualitative treatment of slip power recoverydrives-closedloopcontrol–– vectorcontrol- Applications.

UNITIV SYNCHRONOUS MOTOR DRIVES **9**

V/fcontrolandself-controlofsynchronousmotor:Marginanglecontrolandpowerfactorcontrol-Three phasevoltage/current source fedsynchronousmotor-Applications.

UNITV DESIGNOFCONTROLLERS FOR DRIVES **9**

Transfer functionforDCmotor/ loadand converter–closedloop controlwith Currentandspeed feedback–armaturevoltagecontrolandfield weakening mode– Design ofcontrollers;currentcontroller andspeed controller-converterselection and characteristics.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandandsuggestaconverter forsolidstatedrive.
- Abilityto selectsuitabilitydriveforthe given application.
- Abilitytostudyaboutthesteadystateoperationandtransientdynamicsofamotorloadsystem. Abilityto
- analyze theoperation of theconverter/chopperfed dcdrive.
- Abilityto analyze theoperation and performance ofACmotordrives.
- Abilityto analyzeanddesign thecurrentand speed controllersforaclosedloop solid state DCmotordrive.

TEXTBOOKS:

1. GopalK.Dubey,FundamentalsofElectricalDrives,NarosaPublishingHouse, 1992.
2. BimalK.Bose. ModernPowerElectronicsandAC Drives,PearsonEducation,2002.
3. R.Krishnan, ElectricMotor&Drives:Modeling,AnalysisandControl,Pearson,2001.

REFERENCES

1. VedamSubramanyam, “ElectricDrivesConceptsand Applications”, 2e, McGrawHill,2016

2. ShaahinFelizadeh,"ElectricMachinesandDrives",CRCPress(TaylorandFrancisGroup), 2013.
3. JohnHindmarshandAlasdainRenfrew,"ElectricalMachinesandDrivesSystem,"Elsevier 2012.
4. TheodoreWildi, " Electrical Machines ,Drives and power systems ,6th edition, Pearson Education ,2015
5. N.K.De., P.K. SEN"Electricdrives"PHI,2012.

17153C62	PROTECTIONANDSWITCHGEAR	L	T	P	C
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OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Causesofabnormaloperatingconditions(faults,lightningandswitchingsurges)ofthe apparatusandsystem.
- Characteristicsandfunctionsofrelaysandprotection schemes.
- Apparatusprotection, staticandnumericalrelays
- Functioning ofcircuit breaker

UNITI PROTECTIONSCHEMES 9

Principlesandneedforprotectiveschemes–natureandcausesoffaults–typesoffaults–Methodsof Grounding -Zonesofprotectionandessentialqualities ofprotection–Protection scheme

UNITII ELECTROMAGNETICRELAYS 9

Operating principles of relays - the Universal relay – Torque equation – R-X diagram – ElectromagneticRelays–Overcurrent,Directional,Distance,Differential,NegativesequenceandUnder frequencyrelays.

UNITIII APPARATUS PROTECTION 9

CurrenttransformersandPotentialtransformersandtheirapplicationsinprotectionschemes-Protection oftransformer, generator,motor,busbarsandtransmissionline.

UNITIV STATIC RELAYSANDNUMERICALPROTECTION 9

Static relays – Phase, Amplitude Comparators – Synthesis of various relays using Static comparators – Block diagram of Numerical relays – Over current protection, transformer differential protection, distantprotection oftransmissionlines.

UNITV CIRCUITBREAKERS 9

Physicsofarcingphenomenonandarcinterruption-DCandACcircuitbreaking–re-strikingvoltage and recovery voltage - rate of rise of recovery voltage - resistance switching - currentchopping - interruption of capacitive current - Types of circuit breakers – air blast, air break, oil,SF6, MCBs, MCCBsandvacuumcircuitbreakers–comparisonofdifferentcircuitbreakers– Rating and selection of Circuitbreakers.

TOTAL:45 PERIODS

OUTCOMES:

- Abilityto understandandanalyzeElectromagneticandStaticRelays.
- Abilityto suggestsuitabilitycircuitbreaker.
- Abilitytofindthecausesofabnormaloperatingconditionsoftheapparatusand system.

- Abilitytoanalyze thecharacteristicsand functionsofrelaysandprotectionschemes.
- Abilitytostudy aboutthe apparatusprotection, staticand numerical relays.
- Abilitytoacquireknowledgeonfunctioning ofcircuitbreaker.

TEXTBOOKS:

1. SunilS.Rao,‘SwitchgearandProtection’, KhannaPublishers,NewDelhi, 2008.
2. B.Rabindranath and N.Chander, ‘Power System Protection and Switchgear’, New Age International(P)Ltd.,FirstEdition 2011.
3. ArunIngole, ‘Switch GearandProtection’Pearson Education, 2017.

REFERENCES

1. BadriRam ,B.H. Vishwakarma, ‘Power System Protection and Switchgear’, New Age InternationalPvtLtd Publishers, SecondEdition 2011.
2. Y.G.Paithankar and S.R.Bhide, ‘Fundamentals of power system protection’, Second Edition,PrenticeHallofIndiaPvt.Ltd., NewDelhi, 2010.
3. C.L.Wadhwa, ‘Electrical PowerSystems’, 6th Edition,NewAgeInternational(P)Ltd., 2010
4. RavindraP.Singh,‘SwitchgearandPowerSystemProtection’,PHILearningPrivateLtd., NewDelhi, 2009.
5. VKMetha,”PrinciplesofPowerSystems”S.Chand,2005.
6. BhaveshBhalja,R.P.Maheshwari,NileshG.Chotani,’ProtectionandSwitchgear’Oxford UniversityPress,2011.

17153C63	EMBEDDEDSYSTEMS	L	T	P	C
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OBJECTIVES
:

Toimpartknowledgeon the followingTopics

- Building Blocks ofEmbeddedSystem
- VariousEmbedded DevelopmentStrategies
- BusCommunicationin processors,Input/outputinterfacing.
- Variousprocessorscheduling algorithms.
- BasicsofRealtimeoperatingsystemandexampletutorialstodiscussononerealtime operating systemtool.

UNITI INTRODUCTIONTOEMBEDDEDSYSTEMS 9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor &memory devices- DMA – Memory management methods- Timer and Countingdevices, WatchdogTimer, RealTimeClock,In circuitemulator, TargetHardwareDebugging.

UNITII EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports &Buses– Serial Bus communication protocols RS232 standard – RS422 – RS 485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits(I^2C) –needfordevicedrivers.

UNITIII EMBEDDED FIRMWARE DEVELOPMENTENVIRONMENT 9

EmbeddedProductDevelopmentLifeCycle-objectives,differentphasesofEDLC,Modellingof EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, SequentialProgramModel, concurrentModel, objectorientedModel.

UNITIV RTOS BASEDEMBEDDEDSYSTEMDESIGN 9

Introduction to basic concepts of RTOS- Task, process &threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communication shared memory, message passing-, Inter process Communication– synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance.

UNITV EMBEDDEDSYSTEMAPPLICATIONAND DEVELOPMENT 9

CaseStudyofWashingMachine-AutomotiveApplication-SmartcardSystemApplication-ATM machine–Digitalcamera

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandandanalyzeEmbedded systems.
- Abilityto suggestanembedded systemfora given application.
- Abilityto operatevariousEmbedded DevelopmentStrategies
- Abilityto studyaboutthebusCommunicationin processors.
- Abilityto acquireknowledgeon variousprocessorscheduling algorithms.
- Abilityto understandbasicsofRealtimeoperatingsystem.

TEXTBOOKS:

1. Peckol, “Embeddedsystem Design”,JohnWiley&Sons,2010
2. LylaB Das,”EmbeddedSystems-AnIntegrated Approach”,Pearson, 2013
3. Shibu. K.V,“Introductionto Embedded Systems”, 2e,McgrawHill,2017.

REFERENCES

1. RajKamal, ‘EmbeddedSystem-Architecture, Programming,Design’, McGrawHill,2013.
2. C.R.Sarma,“EmbeddedSystemsEngineering”, UniversityPress (India)Pvt. Ltd,2013.
3. TammyNoergaard, “Embedded SystemsArchitecture”, Elsevier,2006.
4. Han-WayHuang, “Embedded systemDesign UsingC8051”, CengageLearning,2009.
5. Rajib Mall“Real-Time systemsTheoryandPractice”PearsonEducation,2007.

17153L66	POWER ELECTRONICSAND DRIVES LABORATORY	L	T	P	C
		0	0	3	2

OBJECTIVES:

- Toprovidehandsonexperiencewith powerelectronicconvertersandtesting.

LISTOFEXPERIMENTS

1 GatePulseGeneration using R,RCandUJT.
2 CharacteristicsofSCRandTRIAC
3 CharacteristicsofMOSFETandIGBT
4 ACto DChalfcontrolled converter
5 ACto DCfullycontrolledConverter
6 Step down andstep upMOSFETbased choppers
7 IGBTbasedsinglephasePWMinverter

8 IGBTbased threephasePWMinverter
9 ACVoltagecontroller
10 Switched modepowerconverter.
11 SimulationofPEcircuits(1Φ&3Φsemiconverters,1Φ&3Φfullconverters,DC-DC converters,ACvoltagecontrollers).
12 CharacteristicsofGTO&IGCT.
13 CharacteristicsofPMBLDCmotor

TOTAL:60 PERIODS

OUTCOMES:

- Abilitytopracticeandunderstandconverterandinvertercircuitsandapplysoftwarefor engineering problems.
- Abilityto experimentabout switchingcharacteristicsvarious switches.
- AbilitytoanalyzeaboutAC to DCconvertercircuits.
- AbilitytoanalyzeaboutDCto ACcircuits.
- Abilitytoacquireknowledgeon ACto ACconverters
- Abilitytoacquireknowledgeon simulation software.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

1. Devicecharacteristics(forSCR,MOSFET,TRIAC,GTO,IGCTandIGBTkitwithbuilt-in/ discretepowersupplyandmeters)-2 each
2. SinglephaseSCRbasedhalfcontrolledconverterandfullycontrolledconverteralong with built-in/separate/firing circuit/moduleandmeter–2each
3. MOSFETbasedstepupand step down choppers(Built in/Discrete)– 1 each
4. IGBTbased singlephasePWMinvertermodule/DiscreteComponent– 2
5. IGBTbasedthreephasePWMinvertermodule/DiscreteComponent– 2
6. Switched mode powerconvertermodule/DiscreteComponent–2
7. SCR&TRIACbased 1 phaseACcontrolleralongwithlamp or rheostatload-2
8. Cyclo converterkitwithfiring module–1
9. Dualregulated DCpowersupplywith commonground
10. Cathode rayOscilloscope–10
11. IsolationTransformer– 5
12. SinglephaseAuto transformer–3
13. Components (Inductance,Capacitance)3setforeach
14. Multimeter– 5
15. LCRmeter– 3
16. Rheostats ofvariousranges– 2 setsof10value
17. Worktabilitys–10
18. DCandACmetersofrequiredranges– 20
19. Componentdatasheets to beprovided

17153L67MICROPROCESSORS ANDMICROCONTROLLERS LABORATORY **L T P C 0 0 3 2**

OBJECTIVES:

- Toprovide training onprogramming ofmicroprocessorsandmicrocontrollers and understand the interface requirements.
- Tosimulate various microprocessorsandmicrocontrollers using KEILor Equivalent simulator.

LISTOFEXPERIMENTS

1 Simplearithmeticoperations:addition/subtraction /multiplication/division.
2 Programming with control instructions:
(i) Ascending/Descendingorder,Maximum/Minimumofnumbers. (ii) ProgramsusingRotateinstructions.
(iii) Hex/ASCII/BCDcodeconversions.
3 InterfaceExperiments:with8085
(i)A/DInterfacing.&D/AInterfacing.
4 Trafficlightcontroller.
5 I/OPort/Serial communication
6 Programming Practiceswith Simulators/Emulators/open source
7 Read akey,interfacedisplay
8 Demonstration ofbasicinstructionswith 8051 Micro controllerexecution, including:(i) Conditionaljumps&looping
(ii) Calling subroutines.
9 Programming I/OPortandtimerof 8051(i) studyoninterfacewithA/D&D/A
(ii)Studyoninterfacewith DC& AC motors
10 Application hardwaredevelopmentusingembeddedprocessors.

TOTAL:60 PERIODS

OUTCOMES:

- Ability to understand and apply computing platform and software for engineering problems.
- Abilitytoprogramminglogicsforcodeconversion.
- Abilitytoacquireknowledgeon A/DandD/A.
- Abilitytounderstand basicsofserialcommunication.
- Abilitytounderstand andimpartknowledgein DCandACmotorinterfacing.
- Abilitytounderstand basicsofsoftwaresimulators.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

Sl.No.	Description ofEquipment	Quantityrequired
1.	8085MicroprocessorTrainerwith PowerSupply	15
2.	8051Micro ControllerTrainerKitwithpower supply	15
3.	8255Interfaceboards	5
4.	8251Interfaceboards	5

5.	8259Interfaceboards	5
6.	8279Keyboard /Display Interfaceboards	5
7.	8254timer/counters	5
8.	ADCandDACcards	5
9.	AC& DCmotorwith Controllers	5
10.	TrafficLightControlSystems	5

17153MP68MINIPROJECTLTPC

00 4 2

OBJECTIVES:

- Todevelop theirowninnovativeprototypeofideas.
- Totrain thestudentsin preparingminiproject reportsandexamination.

Thestudentsinagroupof5to6worksonatopicapprovedbytheheadofthedepartment and prepares a comprehensive mini project report after completing the work to thesatisfaction.Theprogressofthe projectisevaluatedbasedonaminimumoftworeviews.Thereviewcommitteemaybeconstitutedbythe HeadoftheDepartment.Aminiprojectreportisrequired at the end of the semester. The mini project work is evaluated based on oralpresentationandtheminiprojectreportjointlybyexternalandinternal examinersconstituted bytheHeadof theDepartment.

TOTAL:60 PERIODS

OUTCOMES:

- OnCompletionoftheminiprojectworkstudentswillbeinapositiontotakeuptheir finalyearprojectworkandfind solution byformulatingpropermethodology.

17153C71 **HIGH VOLTAGE ENGINEERING**

L	T	P	C
3	0	0	3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Various typesofovervoltages in powersystemand protection methods.
- Generation ofovervoltagesin laboratories.
- Measurementofovervoltages.
- NatureofBreakdown mechanisminsolid, liquid and gaseousdielectrics.
- Testing ofpowerapparatusand insulation coordination

UNITI OVERVOLTAGES INELECTRICALPOWERSYSTEMS 9

Causesofovervoltagesanditseffectsonpowersystem–Lightning,switchingsurgesand temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection againstovervoltages.

UNITII DIELECTRICBREAKDOWN 9

Properties of Dielectric materials - Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown – Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown mechanisms in solid and compositedielectrics- Applicationsofinsulatingmaterials in electricalequipments.

UNITIII GENERATIONOF HIGHVOLTAGESANDHIGH CURRENTS 9

Generation of High DC voltage: Rectifiers, voltage multipliers, vandigraff generator: generationofhighimpulsevoltage:singleandmultistageMarxcircuits–generationofhigh AC voltages: cascaded transformers, resonant transformer and tesla coil- generation ofswitching surges – generation of impulsecurrents -Triggering and control of impulse generators.

UNITIV MEASUREMENTOF HIGHVOLTAGESANDHIGHCURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixeddividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers,Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNITV HIGHVOLTAGETESTING&INSULATION COORDINATION 9

HighvoltagetestingofelectricalpowerapparatusasperInternationalandIndianstandards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolatorsandtransformers-Insulation Coordination& testing ofcabilitys.

OUTCOMES: **TOTAL:45PERIODS**

- Abilityto understandTransients in powersystem.
- Abilityto understand Generation andmeasurementofhigh voltage.
- Abilityto understandHigh voltage testing.
- Abilityto understandvarious typesofovervoltagesinpowersystem.
- Abilityto measureovervoltages.
- Abilityto testpowerapparatusand insulation coordination

TEXTBOOKS:

1. S.Naidu and V. Kamaraju, ‘High Voltage Engineering’, Tata McGraw Hill, Fifth Edition,2013.

2. E. Kuffel and W.S. Zaengl, J.Kuffel, ‘High voltage Engineering fundamentals’, NewnesSecond Edition Elsevier, NewDelhi, 2005.

3. C.L.Wadhwa,‘HighvoltageEngineering’,NewAgeInternationalPublishers,Third Edition,2010.

REFERENCES

1. L.L.Alston,‘HighVoltageTechnology’,OxfordUniversityPress,FirstIndianEdition, 2011.

2. Mazen Abdel– Salam,Hussein Anis,Ahdab A-Morshedy,RoshdayRadwan,High VoltageEngineering– Theory&Practice, SecondEdition MarcelDekker, Inc., 2010.

3. Subir Ray,’ An Introduction to High Voltage Engineering’ PHI Learning Private Limited,New Delhi, Second Edition, 2013.

		L	T	P	C
17153C72	**POWER SYSTEMOPERATIONANDCONTROL**	**3**	**0**	**0**	**3**

OBJECTIVES:

Toimpartknowledgeon the following topics

- Significanceofpowersystemoperation andcontrol.
- Realpower-frequency interaction anddesign ofpower-frequencycontroller.
- Reactive power-voltage interaction and the control actions to be implemented for maintainingthevoltageprofileagainstvarying system load.
- Economicoperation ofpowersystem.
- SCADAand itsapplicationfor realtimeoperation andcontrolofpowersystems

UNITI PRELIMINARIES ONPOWERSYSTEMOPERATIONAND CONTROL 9

Power scenario in Indian grid – National and Regional load dispatching centers – requirementsofgoodpowersystem-necessityofvoltageandfrequencyregulation-realpower vsfrequencyandreactivepowervsvoltagecontrolloops-systemloadvariation,loadcurves and basic concepts of load dispatching - load forecasting - Basics of speed governing mechanisms and modeling - speed load characteristics - regulation of two generatorsin parallel.

UNITII REALPOWER-FREQUENCYCONTROL 9

Load Frequency Control (LFC) of single area system-static and dynamic analysis of uncontrolled and controlled cases - LFC of two area system - tie line modeling - block diagram representation of two area system - static and dynamic analysis - tie line with frequencybias control–statevariabilitymodel-integrationofeconomicdispatchcontrolwith LFC.

UNITIII REACTIVE POWER– VOLTAGE CONTROL 9

Generation and absorption of reactive power - basics of reactive power control – Automatic Voltage Regulator (AVR) – brushless AC excitation system – block diagram representationof AVR loop - static and dynamic analysis – stability compensation – voltage drop in transmissionline-methodsofreactivepowerinjection-tapchangingtransformer,SVC(TCR+ TSC)andSTATCOMforvoltagecontrol.

UNITIV ECONOMICOPERATIONOFPOWERSYSTEM 9

Statement of economic dispatch problem - input and output characteristics of thermal plant - incrementalcostcurve-optimaloperationofthermalunitswithoutandwithtransmissionlosses (noderivationoftransmissionlosscoefficients) -basepointandparticipationfactorsmethod-statementofunitcommitment(UC)problem-constraintsonUCproblem- solution ofUCproblem usingprioritylist–specialaspectsofshorttermandlongtermhydrothermalproblems.

UNITV COMPUTER CONTROLOF POWERSYSTEMS 9

Needofcomputercontrolofpowersystems-conceptofenergy controlcentersandfunctions –PMU-systemmonitoring,dataacquisitionandcontrols-Systemhardwareconfigurations - SCADA and EMS functions - state estimation problem – measurements and errors - weightedleastsquareestimation -variousoperatingstates-state transition diagram.

TOTAL:45 PERIODS

OUTCOMES:

- Abilitytounderstand the day-to-dayoperation ofelectricpower system.
- Abilitytoanalyzethecontrolactionstobeimplementedonthesystemtomeettheminute- to-minutevariation ofsystemdemand.
- Abilityto understandthesignificance ofpower systemoperation and control.
- Abilityto acquireknowledgeon realpower-frequencyinteraction.
- Abilityto understandthereactivepower-voltage interaction.
- Abilitytodesign SCADAand itsapplicationfor realtimeoperation

TEXTBOOKS:

1. Olle.I.Elgerd, ‘Electric Energy Systems theory - An introduction’, McGraw Hill Education Pvt.Ltd., New Delhi, 34threprint, 2010.

2. Allen. J. Wood and Bruce F. Wollen berg, ‘Power Generation, Operation and Control’, JohnWiley&Sons,Inc., 2016.

3. Abhijit Chakrabarti and Sunita Halder, ‘Power System Analysis Operation and Control’,PHIlearning Pvt.Ltd., NewDelhi, ThirdEdition, 2010.

REFERENCES

1. Kothari D.P. and Nagrath I.J., ‘Power System Engineering’, Tata McGraw-Hill Education, Second Edition,2008.

2. HadiSaadat,‘PowerSystemAnalysis’,McGrawHillEducationPvt.Ltd.,NewDelhi, 21streprint, 2010.

3. KundurP.,‘PowerSystemStabilityandControl,McGrawHillEducationPvt.Ltd., New Delhi,10th reprint,2010.

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17153C73 **RENEWABLEENERGY SYSTEMS** **L T P C**
3 0 0 3

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- AwarenessaboutrenewableEnergySourcesand technologies.
- Adequateinputson avarietyof issuesin harnessing renewableEnergy.
- Recognizecurrentand possiblefutureroleof renewableenergysources.

UNITI RENEWABLE ENERGY(RE)SOURCES 9

Environmentalconsequencesoffossilfueluse,Importanceofrenewablesourcesofenergy, Sustainable Design and development, Types of RE sources, Limitations of RE sources,PresentIndianand internationalenergyscenario ofconventionalandREsources.

UNITII WIND ENERGY 9

PowerintheWind–TypesofWindPowerPlants(WPPs)–ComponentsofWPPs-Working ofWPPs- Siting ofWPPs-Grid integrationissuesofWPPs.

UNITIII SOLARPVANDTHERMALSYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants,SolarPonds.-ThermalEnergystoragesystemwithPCM-SolarPhotovoltaic systems:Basic PrincipleofSPVconversion–TypesofPVSystems-TypesofSolarCells, Photovoltaiccellconcepts: Cell,module,array,PVModuleI-VCharacteristics,Efficiency&Quality of the Cell, series and parallel connections, maximum power point tracking, Applications.

UNITIV BIOMASS ENERGY 9

Introduction-Biomassresources–Energyfrom Biomass:conversionprocesses-BiomassCogeneration-EnvironmentalBenefits.GeothermalEnergy:Basics,Direct Use,Geothermal Electricity.Mini/micro hydropower:Classificationofhydropowerschemes,Classificationof waterturbine, Turbinetheory, Essentialcomponentsofhydroelectric system.

UNITV OTHER ENERGYSOURCES 9

TidalEnergy:Energyfromthetides,BarrageandNonBarrageTidalpowersystems.WaveEnergy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion(OTEC)-Hydrogen ProductionandStorage-Fuelcell:Principleofworking-varioustypes- constructionandapplications. EnergyStorageSystem-Hybrid EnergySystems.

TOTAL:45 PERIODS

OUTCOMES:

- Abilityto createawarenessaboutrenewableEnergySourcesandtechnologies. Abilityto
- getadequateinputson avariety of issuesin harnessing renewableEnergy. Abilityto
- recognizecurrentandpossiblefuture roleofrenewableenergy sources.
- Abilityto explain thevarious renewableenergyresourcesandtechnologiesandtheirapplications.
- Abilityto understandbasicsaboutbiomassenergy.
- Abilityto acquireknowledgeaboutsolarenergy.

TEXTBOOKS:

1. JoshuaEarnest,ToreWizeliu, 'WindPowerPlantsandProjectDevelopment',PHILearning Pvt.Ltd,NewDelhi, 2011.

2. D.P.Kothari,K.CSingal,RakeshRanjan"RenewableEnergySourcesandEmerging Technologies",PHILearning Pvt.Ltd, NewDelhi, 2013.

3. Scott Grinnell, "Renewable Energy &Sustainable Design", CENGAGE Learning,USA, 2016.

REFERENCES

1. A.K.Mukerjee and Nivedita Thakur,” Photovoltaic Systems: Analysis and Design”, PHI Learning PrivateLimited,NewDelhi,2011

2. Richard A. Dunlap,” Sustainable Energy” Cengage Learning India Private Limited,Delhi, 2015.

3. Chetan Singh Solanki, “ Solar Photovoltaics : Fundamentals,Technologies and Applications”, PHILearningPrivateLimited,NewDelhi, 2011

4. Bradley A. Striebig,Adebayo A.Ogundipe and Maria Papadakis,” Engineering Applications in Sustainable Design and Development”, Cengage Learning India Private Limited, Delhi,2016.

5. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with theOpen University,2004.

6. Shobh Nath Singh, ‘Non-conventionalEnergyresources’PearsonEducation,2015.

		L	T	P	C
17153L77	**POWERSYSTEMSIMULATION LABORATORY**	**0**	**0**	**3**	**2**

OBJECTIVES:

- Toprovidebetterunderstanding ofpower systemanalysis through digitalsimulation.

LISTOFEXPERIMENTS

1 Computation ofTransmission LineParameters
2 Formation ofBusAdmittanceandImpedanceMatricesandSolution ofNetworks
3 PowerFlowAnalysisusingGauss-Seidel Method
4 PowerFlowAnalysisusingNewton RaphsonMethod
5 Symmetricandunsymmetricalfaultanalysis
6 Transient stabilityanalysis ofSMIBSystem
7 EconomicDispatchin PowerSystems
8 Load – FrequencyDynamicsofSingle-AreaandTwo-AreaPowerSystems
9 Stateestimation:Weighted leastsquareestimation
10 ElectromagneticTransientsin PowerSystems:Transmission LineEnergization

OUTCOMES: **TOTAL:60 PERIODS**

- Abilityto understand powersystemplanningandoperationalstudies.
- AbilitytoacquireknowledgeonFormationofBusAdmittanceandImpedanceMatrices and Solution ofNetworks.
- Abilitytoanalyze the powerflowusingGSandNRmethod
- AbilitytofindSymmetric and Unsymmetricalfault
- Abilitytounderstand theeconomicdispatch.
- Abilitytoanalyze the electromagnetictransients.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

1. Personalcomputers(Inteli3,80GB,2GBRAM)– 30 nos
2. Printer laser-1 No.
3. Dotmatrix-1 No.
4. Server(Inteli5, 80GB, 2GBRAM) (High SpeedProcessor)– 1 No.
5. Software:anypowersystemsimulationsoftwarewith 5 userlicense
6. Compliers:C,C++, VB,VC++-30 users

RENEWABLEENERGYSYSTEMS LABORATORY	L	T	P	C
	0	0	3	2

OBJECTIVES:

- Totrain the studentsinRenewableEnergySourcesand technologies.
- Toprovideadequateinputsonavariety ofissuesin harnessing RenewableEnergy.
- Torecognizecurrentand possiblefuture roleofRenewableenergysources.

LISTOFEXPERIMENTS

1 Simulation studyon SolarPVEnergySystem.

2 Experimenton “VI-CharacteristicsandEfficiencyof1kWp SolarPVSystem”.

3 Experimenton“Shadowing effect&diodebasedsolution in1kWpSolarPVSystem”.

4 ExperimentonPerformanceassessmentofGridconnectedandStandalone1kWpSolar PowerSystem.

5 Simulation studyonWindEnergyGenerator.

6 Experimenton PerformanceassessmentofmicroWindEnergyGenerator.

7 Simulation studyon Hybrid(Solar-Wind)PowerSystem.

8 Experimenton PerformanceAssessmentofHybrid (Solar-Wind)PowerSystem.

9 Simulation studyon HydelPower.

10 Experimenton PerformanceAssessmentof100WFuelCell.

11 Simulation studyonIntelligentControllers forHybridSystems.

OUTCOMES:

- Abilityto understandandanalyzeRenewableenergysystems.

TOTAL:60 PERIODS

- Abilityto train thestudentsinRenewable EnergySourcesandtechnologies.
- Abilityto provide adequateinputson avarietyof issuesin harnessing Renewable Energy.
- AbilitytosimulatethevariousRenewableenergysources.
- Abilityto recognizecurrentandpossiblefuture roleofRenewable energy sources.
- Abilitytounderstand basicsofIntelligent Controllers.

LISTOFEQUIPMENTFORABATCHOF30 STUDENTS:

S.No	Nameoftheequipments/Components	Quantity Required	Remarks
1.	Personal computers (Intel i3,80GB, 2GBRAM)	15	-
2.	CRO	9	30MHz
3.	DigitalMultimeter	10	Digital
4.	PVpanels-100W, 24V	1	
5.	Batterystorage systemwithchargeand dischargecontrol40Ah	1	
6.	PVEmulator	1	
7.	MicroWind EnergyGeneratormodule	1	

Consumabilitys(Minimumof5 Nos.each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Componentdatasheetsto beprovided		

17153CEC-COMPS 0 0 2 2

Electric Circuits andFields:

Networkgraph,KCL,KVL,node andmeshanalysis,transientresponse of dc andac networks;sinusoidal steady-stateanalysis, resonance, basic filterconcepts;ideal currentand voltagesources, Thevenin's, Norton'sandSuperpositionandMaximum PowerTransfertheorems,two-portnetworks,threephase circuits;GaussTheorem,electricfieldand potentialduetopoint,line,plane andsphericalcharge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signalsand Systems:

Representation ofcontinuous and discrete-timesignals;shifting and scaling operations; linear, time-invariantand causalsystems;Fourier series representationofcontinuousperiodic signals;sampling theorem;Fourier,Laplace andZtransforms.

ElectricalMachines:

Singlephase transformer–equivalentcircuit,phasordiagram,tests,regulationandefficiency;threephase transformers–connections,paralleloperation;auto-transformer;energy conversionprinciples;DC machines–types,windings,generatorcharacteristics,armature reactionandcommutation,starting and speedcontrolof motors;three phase inductionmotors–principles,types,performance characteristics, starting and speed control; single phase induction motors; synchronous machines – performance, regulationandparalleloperationofgenerators,motorstarting,characteristicsandapplications;servoand stepper motors.

Power Systems:

Basicpowergenerationconcepts;transmissionline modelsandperformance;cable performance, insulation;corona and radiointerference;distributionsystems;per-unitquantities;busimpedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetricalcomponents;faultanalysis;principlesof over-current,differentialanddistance protection; solidstaterelaysanddigitalprotection;circuitbreakers; systemstabilityconcepts,swing curvesandequal areacriterion;HVDC transmission and FACTSconcepts.

Control Systems:

Principlesof feedback;transfer function;block diagrams;steady-state errors;RouthandNiquist techniques;Bodeplots;rootloci;lag,leadandlead-lag compensation;statespacemodel;statetransition matrix, controllabilityand observability.

ElectricalandElectronic Measurements:

Bridgesandpotentiometers;PMMC,movingiron,dynamometer andinductiontype instruments; measurementofvoltage,current,power,energy andpowerfactor;instrumenttransformers;digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders;erroranalysis.

AnalogandDigitalElectronics:
Characteristicsofdiodes,BJT,FET;amplifiers–biasing,equivalentcircuitandfrequency response; oscillators andfeedbackamplifiers; operational amplifiers– characteristics andapplications; simple active filters;VCOs and timers;combinationaland sequentiallogiccircuits;multiplexer; Schmitttrigger;multi-vibrators;sampleandholdcircuits;A/DandD/Aconverters;8-bitmicroprocessorbasics,architecture, programming and interfacing.

Power Electronics andDrives:
Semiconductor powerdiodes, transistors, thyristors, triacs, GTOs, MOSFETs andIGBTs–static characteristicsandprinciplesofoperation;triggering circuits;phasecontrolrectifiers;bridgeconverters–fullycontrolledandhalfcontrolled;principlesofchoppersandinverters;basisconceptsofadjustable speed dc andacdrives.

17153E64A **ADVANCED CONTROLSYSTEM** **LTPC**
22 0 3

OBJECTIVES

i. Toprovideknowledgeon design statefeedbackcontroland stateobserver. ii. Toprovideknowledgein phaseplane analysis.
iii. Togivebasicknowledge indescribingfunction analysis. iv. Tostudythedesign ofoptimalcontroller.
v. Tostudythedesign ofoptimal estimator includingKalman Filter

UNITI STATEVARIABLEANALYSIS **6+6**

Introduction-conceptsof state variablesand statemodel-State modelforlinear continuoustimesystems, Diagonalisation-solution ofstateequations- Conceptsofcontrollabilityandobservability.

UNITII STATEVARIABLE DESIGN **6+6**

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design ofservo systems: Statefeedbackwith integralcontrol.

UNITIII SAMPLED DATA ANALYSIS **6+6**

IntroductionspectrumanalysisofsamplingprocesssignalreconstructiondifferenceequationsTheZ transform function, the inverse Z transform function, response of Linear discrete system, the Ztransformanalysis of sampled data control systems, response between sampling instants, the Z andS domainrelationship. Stabilityanalysisandcompensation techniques.

UNITIV NONLINEARSYSTEMS **6+6**

Introduction, common physical nonlinearites, The phase plane method: concepts, singular points,stability of non linear systems, construction of phase trajectories system analysis by phase planemethod. The describingfunctionmethod, stabilityanalysisbydescribingfunctionmethod,Jump resonance.

UNITV OPTIMALCONTROL **6+6**

Introduction: Classical control and optimization, formulation of optimal control problem, Typical optimal controlperformancemeasures-Optimalstateregulatordesign:Lyapunovequation,MatrixRiccatiequation -LQRsteady stateoptimalcontrol–Application examples.

OUTCOMES: **TOTAL:60 PERIODS**

i. Able to designstatefeedbackcontrollerand stateobserver.
ii. Able to understand and analyse linear and nonlinear systems using phase plane method. iii. Able to understand and analysenonlinearsystemsusingdescribingfunction method.
iv. Able to understand and design optimalcontroller.
v. Able to understand optimalestimator including KalmanFilter.
vi. Abilityto applyadvancedcontrolstrategiesto practicalengineering problems.

TEXTBOOKS:

1. M.Gopal, “DigitalControlandStateVariableMethods”,4th edition, Mc GrawHillIndia,2012
2. K.Ogata, ‘Modern ControlEngineering’,5th Edition,Pearson, 2012.
3. K. P. Mohandas,“Modern Control Engineering”,SanguineTechnicalPublishers, 2006.

REFERENCES:

1. M.Gopal, Modern ControlSystemTheory,3rdedition, NewAgeInternationalPublishers, 2014.
2. WilliamS Levine,“ControlSystemFundamentals,”TheControlHandbook,CRCPress,Taylerand FranciesGroup,2011.
3. AshishTewari, ‘Modern ControlDesign with Matlab andSimulink’,JohnWiley,NewDelhi,2002.
4. T.GladandL.Ljung,,“ControlTheory–MultivariableandNon-LinearMethods”,Taylor&Francis, 2002.

17153E64B VISUALLANGUAGESANDAPPLICATIONS L T P C
3 0 0 3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Tostudyabouttheconceptsofwindowsprogrammingmodels,MFCapplications,drawingwith the GDI, getting inputsfromMouseand theKeyboard.
- Tostudythe concepts ofMenubasics,menumagicandclassiccontrolsof thewindows programming using VC++.
- TostudytheconceptofDocument/ViewArchitecturewith single&multipledocument interface, toolbars,statusbarsandFileI/OSerialization.
- Tostudyabouttheintegrated developmentprogramming event driven programming,variabilitys,constants, proceduresandbasicActiveXcontrolsin visualbasic.
- Tounderstand thedatabaseandthedatabasemanagement system, visualdatamanager,databound controlsandADOcontrolsin VB.

UNITI FUNDAMENTALS OF WINDOWSAND MFC 9

Messages - Windows programming - SDK style - Hungarian notation and windows datatypes - SDK programming in perspective. The benefits of C++ and MFC - MFC designphilosophy – Document / View architecture - MFC class hierarchy - AFX functions. Applicationobject-Framewindowobject- Messagemap. Drawingthelines–Curves–Ellipse–Polygonsandothershapes.GDI pens–Brushes-GDI fonts-DeletingGDIobjectsand deselecting GDI objects. Getting input from the mouse: Client &Non- client - Areamouse messages -Mouse wheel - Cursor. Gettinginput fromthe keyboard: Input focus - Keystrokemessages-Virtualkeycodes-Character&deadkeymessages.

UNITII RESOURCESAND CONTROLS 9

Creatingamenu–Loadinganddisplayingamenu–Respondingtomenucommands– Commandranges- Updating the items in menu, update ranges – Keyboard accelerators.Creatingmenusprogrammatically-Modifyingmenusprogrammatically-Thesystemmenu- Ownerdrawmenus–Cascadingmenus-Context menus. TheCbuttonclass–Clistboxclass–Cstaticclass-Thefontviewapplication–Ceditclass–C comboboxclass–Cscrollbarclass. Modeldialog boxes–Modelessdialog boxes.

UNITIII DOCUMENT/VIEWARCHITECTURE 9

Theinexistencefunctionrevisited–Documentobject–Viewobject–Framewindowobject –Dynamicobjectcreation.SDIdocumenttemplate -Commandrouting.Synchronizingmultipleviewsof adocument–Midsquaresapplication–Supportingmultipledocument types–AlternativestoMDI.SplitterWindows:Dynamicsplitterwindow –Staticsplitter windows.Creating&initializingatoolbar-Controllingthetoolbar'svisibility–Creating& initializing a status bar - Creating custom status bar panes – Status bar support inappwizard. Opening,closingandcreatingthefiles-Reading&Writing–Cfilederivatives–Serialization basics-Writing serializability classes.

UNITIV FUNDAMENTALS OFVISUALBASIC 9

Menubar–Toolbar–Projectexplorer–Toolbox–Propertieswindow–Formdesigner– Formlayout–Intermediatewindow.Designingtheuserinterface:Aligningthecontrols–Running theapplication –Visual developmentand eventdriven programming.

Variabilitys:Declaration–Types–Convertingvariabilitytypes–Userdefineddatatypes- Lifetimeofa variability.Constants-Arrays–Typesofarrays.Procedures:Subroutines–Functions–Callingprocedures. Textboxcontrols–Listbox&Comboboxcontrols–Scrollbarand slidercontrols– Filecontrols.

UNITV DATABASEPROGRAMMINGWITHVB 9

Recordsets–Datacontrol–Datacontrolproperties,methods.Visualdatamanager:Specifying indices with the visual data manager – Entering data with the visual datamanager. Databoundlistcontrol– Data bound combo box – Data bound grid control.Mappingdatabases:Databaseobject–Tabilitydef object,Query defobject. Programming theactivedatabaseobjects–ADOobjectmodel–Establishinga connection-Executing SQLstatements–Cursortypesandlockingmechanism–Manipulatingtherecord setobject– Simple record editing andupdating.

OUTCOMES:

- Abilitytounderstandandapplycomputingplatformandsoftwareforengineeringproblems
- Abilitytostudy abouttheconceptsofwindowsprogramming models.
- Abilitytostudytheconceptsof Menubasics,menumagicand classiccontrols.
- AbilitytostudytheconceptofDocument/ViewArchitecturewith single& multipledocument interface.
- Abilitytostudy abouttheintegrated developmentprogramming eventdriven programming.
- Abilitytounderstand thedatabaseandthedatabasemanagementsystem.

TEXTBOOKS:

1. JeffProsise,'ProgrammingWindowsWithMFC',SecondEdition,WPPublishers&Distributors (P) Ltd, Reprinted,2002.
2. EvangelosPetroutsos, 'Mastering VisualBasic6.0',BPBPublications,2002.

REFERENCES

1. HerbertSchildt,'MFCProgrammingFromtheGroundUp',SecondEdition,McGraw Hill,reprinted, 2002.
2. JohnPaulMuller,'VisualC++6FromtheGroundUpSecondEdition',McGrawHill, Reprinted, 2002.
3. CurtisSmith&MichealAmundsen,'TeachYourself DatabaseProgrammingwith Visual Basic6in 21days',TechmediaPub, 1999.

17153E64C	DESIGNOFELECTRICALAPPARATUS	L	T	P	C
		3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Magneticcircuitparametersand thermalrating ofvarious typesofelectricalmachines.
- Armatureandfieldsystems forD.C. machines.
- Core,yoke,windingsand coolingsystemsof transformers.
- Design ofstatorand rotorof induction machinesand synchronousmachines.
- Theimportanceofcomputeraideddesign method.

UNITI DESIGNOFFIELDSYSTEMANDARMATURE 9

MajorconsiderationsinElectricalMachineDesign–MaterialsforElectricalapparatus– Designof Magneticcircuits–Magnetisingcurrent–Fluxleakage–LeakageinArmature. Designof lap winding and wavewinding.

UNITII DESIGNOFTRANSFORMERS 9

Construction-KVAoutputforsingleandthreephasetransformers–Overalldimensions– designofyoke, coreandwindingforcoreandshelltypetransformers–Estimationof Noloadcurrent–Temperaturerise inTransformers–DesignofTankandcoolingtubesofTransformers.Computerprogram:CompleteDesign ofsingle phasecoretransformer

UNITIII DESIGNOFDCMACHINES 9

Construction - Output Equations – Main Dimensions – Choice of specific loadings –Selectionof numberofpoles–Designof Armature–Designofcommutatorandbrushes–designoffieldComputer program:Design ofArmaturemain dimensions

UNITIV DESIGNOF INDUCTIONMOTORS 9

Construction-OutputequationofInductionmotor–Maindimensions–choiceofspecificloadings–Design of squirrel cage rotor and wound rotor –Magnetic leakage calculations – Operating characteristics : Magnetizingcurrent-Shortcircuitcurrent–Circlediagram-Computerprogram:Design ofslip-ringrotor

UNITV DESIGNOFSYNCHRONOUS MACHINES 9

Output equations – choice of specific loadings – Design of salient pole machines – Shortcircuitratio–Armaturedesign–Estimationofairgaplength–Designofrotor–Designofdamperwinding–Determination offullloadfieldMMF–Designoffieldwinding–Designofturbo alternators -Computer program: Design of Statormaindimensions-BrushlessDCMachines

OUTCOMES: TOTAL: 45PERIODS

- Abilitytounderstandbasicsofdesignconsiderationsforrotatingandstaticelectricalmachines
- Abilitytodesign offieldsystemfor itsapplication.
- Abilitytodesign singandthreephasetransformer.
- Abilitytodesign armatureandfield ofDCmachines.
- Abilitytodesignstatorandrotorofinduction motor.

TEXTBOOKS:

1. Sawhney,A.K.,'ACourseinElectricalMachineDesign',DhanpatRai&Sons,New Delhi,Fifth Edition, 1984.

2. MVDeshpande'DesignandTestingofElectricalMachines'PHIlearningPvtLt, 2011.

3. Sen,S.K.,'PrinciplesofElectricalMachineDesignswithComputerProgrammes',Oxford andIBH PublishingCo.Pvt.Ltd., NewDelhi,SecondEdition,2009.

REFERENCES

1. A.Shanmugasundaram,G.Gangadharan,R.Palani'ElectricalMachineDesignData Book', NewAgeInternationalPvt.Ltd., Reprint2007.

2. 'ElectricalMachineDesign',BalbirSingh,VikasPublishingHousePrivateLimited, 1981.

3. VRajini,V.S Nagarajan,'ElectricalMachineDesign', Pearson, 2017.

4. K.M.Vishnumurthy 'Computer aided design of electrical machines' B S Publications,2008

17153E64D	POWERSYSTEMSTABILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Tounderstand the fundamentalconceptsofstabilityofpower systems and its classification.
- Toexpose thestudentsto dynamicbehaviour of thepower systemfor smallandlarge disturbances.
- Tounderstand andenhancethestability ofpower systems.

UNITI INTRODUCTIONTOSTABILITY 9

Fundamentalconcepts-Stabilityand energyof asystem-Power SystemStability:Definition, Causes, Nature and Effects of disturbances, Classification of stability,Modelling of electrical components - Basic assumptions made in stability studies- Modelling of Synchronousmachineforstabilitystudies(classicalmodel)-Rotordynamicsand the swing equation.

UNITII SMALL-SIGNALSTABILITY 9

Basic concepts and definitions – State space representation, Physical Interpretation ofsmall–signalstability,Eigenpropertiesofthestatematrix:Eigenvaluesandeigenvectors,modal matrices, eigenvalueandstability,modeshapeandparticipationfactor.Small–signal stability analysis of a Single-Machine Infinite Bus (SMIB) Configuration with numerical example.

UNITIII TRANSIENTSTABILITY 9

Reviewofnumericalintegrationmethods:modifiedEulerandFourthOrderRunge-Kuttamethods, Numerical stability,. Interfacing of Synchronous machine (classical machine) model to the transientstabilityalgorithm(TSA)withpartitioned–explicitapproaches- ApplicationofTSA to SMIBsystem.

UNITIV VOLTAGE STABILITY 9

Factors affectingvoltagestability- ClassificationofVoltagestability-Transmissionsystem characteristics- Generator characteristics- Load characteristics- Characteristics ofreactive powercompensatingDevices-Voltagecollapse.

UNITV ENHANCEMENT OF SMALL-SIGNAL STABILITYANDTRANSIENT STABILITY 9

PowerSystemStabilizer–.Principlebehindtransientstabilityenhancementmethods:high-speed fault clearing, regulated shunt compensation, dynamic braking, reactorswitching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving,high-speed excitation systems.

TOTAL: 45 PERIODS

OUTCOMES:

- Learnerswillattainknowledgeabout thestability ofpower system
- Learnerswillhaveknowledgeon small-signal stability, transientstabilityandvoltage stability.
- Learnerswillbeable to understand thedynamicbehaviourofsynchronousgenerator fordifferentdisturbances.
- Learnerswillbeable to understand thevariousmethods to enhancethestability ofapower system.

TEXTBOOKS:

1. Powersystemstability and control,P. Kundur;edited byNealJ. Balu, MarkG. Lauby,
McGraw-Hill,1994.
2. R.Ramnujam," PowerSystemDynamicsAnalysisand Simulation, PHI Learning PrivateLimited, NewDelhi,2009
3. T.V. Cutsemand C.Vournas,"VoltageStabilityof ElectricPowerSystems", Kluwerpublishers, 1998.

REFERENCES

1 PeterW., Saucer,PaiM.A., "PowerSystemDynamicsandStability,Pearson Education (Singapore), 9th Edition, 2007.
2 EW. Kimbark., "PowerSystemStability",JohnWiley&Sons Limited,NewJersey, 2013.
3 SB.Crary., "PowerSystemStability", JohnWiley&Sons Limited,NewJersey,1955.
4 K.N.Shubhanga,"PowerSystem Analysis"Pearson,2017.
5 Powersystemsdynamics:Stabilityandcontrol/K.R.Padiyar,BSPublications,2008
6 Powersystemcontrol and StabilityP.M.Anderson,A.A.Foud,IowaStateUniversity Press, 1977.

		L	T	P	C
17153E64E	**MODERN POWER CONVERTERS**	3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Switched modepowersupplies
- MatrixConverter
- Soft switched converters

UNITI SWITCHEDMODEPOWERSUPPLIES (SMPS) 9

DCPowersuppliesandClassification;Switchedmodedcpowersupplies- withandwithout isolation,singleand multiple outputs; Closed loop control and regulation; Design examples on converter and closed loop performance.

UNITII AC-DC CONVERTERS 9

Switched mode AC-DC converters. synchronous rectification - single and three phase topologies - switchingtechniques-highinputpowerfactor.reducedinputcurrentharmonic distortion.improvedefficiency. withandwithoutinput-outputisolation.performanceindices design examples

UNITIII DC-AC CONVERTERS 9

Multi-levelInversion-concept,classificationofmultilevelinverters,Principleofoperation, mainfeaturesand analysisofDiodeclamped,Flyingcapacitorandcascadedmultilevelinverters;Modulation schemes.

UNITIV AC-AC CONVERTERSWITHANDWITHOUTDC LINK 9

Matrix converters. Basic topology of matrix converter; Commutation – current path;Modulation techniques- scalarmodulation,indirectmodulation;Matrixconverterasonly AC-DCconverter;AC-AC converterwithDClink- topologiesandoperation-withandwithoutresonancelink-converterwithdc linkconverter;Performancecomparisonwithmatrixconverterwith DClinkconverters.

UNITV SOFT-SWITCHINGPOWER CONVERTERS 9

Softswitchingtechniques.ZVS,ZCS,quasiresonanceoperation;Performancecomparison hardswitched and soft switched converters.AC-DC converter, DC-DC converter, DC-ACconverter.;ResonantDC powersupplies.

OUTCOMES: **TOTAL: 45 PERIODS**

•Abilityto suggestconverters forAC-DCconversionandSMPS

TEXTBOOKS:

1. PowerElectronicsHandbook,M.H.Rashid,Academicpress, Newyork, 2000.
2. AdvancedDC/DC Converters, Fang Lin Luo andFangLin Luo, CRCPress, NewYork,2004.
3. Control in PowerElectronics-Selected Problem, Marian P.Kazmierkowski, R.KrishnanandFrede Blaabjerg,AcademicPress(ElsevierScience), 2002.

REFERENCES

1. PowerElectronicCircuits, IssaBatarseh,JohnWiley and Sons, Inc.2004
2. PowerElectronicsforModernWindTurbines,FredeBlaabjergandZhe Chen, Morgan & ClaypoolPublishersseries,United Statesof America, 2006.
3. Krein PhilipT, ElementsofPowerElectronics,OxfordUniversitypress,2008
4. Agarwal,PowerElectronics:Converters, Applications,andDesign, 3rdedition,JaiP, PrenticeHall,2000
5. L.Umanand, PowerElectronics:Essentials& Applications,JohnWileyandSons, 2009.

17153E64F	INTELLECTUAL PROPERTYRIGHTS	L T P C
		3 0 0 3

OBJECTIVE:

- Togivean idea aboutIPR,registration and itsenforcement.

UNITI INTRODUCTION 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, GeographicalIndications,IPRinIndiaandAbroad–GenesisandDevelopment–thewayfromWTOto WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research,Inventions andInnovations– ImportantexamplesofIPR.

UNITII REGISTRATIONOFIPRs 10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications,Trade SecretsandIndustrial Design registrationin Indiaand Abroad

UNITIII AGREEMENTSANDLEGISLATIONS 10

InternationalTreatiesandConventionsonIPRs,TRIPSAgreement,PCTAgreement,PatentActof India,PatentAmendmentAct,Design Act,TrademarkAct, GeographicalIndication Act.

UNITIV DIGITALPRODUCTSANDLAW 9

Digital Innovations and Developments as Knowledge Assets – IP Laws, Cyber Law and DigitalContent Protection–UnfairCompetition–MeaningandRelationshipbetweenUnfairCompetitionandIPLaws– Case Studies.

UNITV ENFORCEMENT OFIPRs 7

InfringementofIPRs,EnforcementMeasures, Emerging issues– CaseStudies.

TOTAL:45 PERIODS

OUTCOME:

+ Abilityto manageIntellectualPropertyportfolio toenhance thevalueofthefirm.

TEXTBOOKS

1. V. ScopleVinod,Managing IntellectualProperty, PrenticeHallofIndiapvtLtd, 2012
2. S.V.Satakar,“IntellectualProperty RightsandCopy Rights,EssEssPublications,New Delhi, 2002

REFERENCES:

1. Deborah E.Bouchoux,“IntellectualProperty:TheLawofTrademarks,Copyrights,Patents and TradeSecrets”, CengageLearning,Third Edition,2012.
2. Prabuddha Ganguli,”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGrawHillEducation,2011.
3. EditedbyDerekBosworthandElizabethWebster,TheManagementofIntellectual Property, EdwardElgarPublishingLtd., 2013.

17153E65APRINCIPLESOFROBOTICS **LTPC**
30 0 3

OBJECTIVES:

- Tointroducethefunctionalelements of Robotics
- Toimpartknowledgeon thedirectandinversekinematics
- Tointroducethemanipulatordifferentialmotion and control
- Toeducateonvariouspathplanningtechniques
- Tointroducethedynamicsandcontrolofmanipulators

UNITI BASICCONCEPTS **9**
Brief history-Types of Robot–Technology-Robot classifications and specifications-Design andcontrolissues-Variousmanipulators– Sensors-workcell-Programminglanguages.

UNITII DIRECTANDINVERSEKINEMATICS **9**
MathematicalrepresentationofRobots-Positionandorientation–Homogeneoustransformation-Variousjoints-RepresentationusingtheDenavitHattenbergparameters-Degreesoffreedom-Direct kinematics-Inversekinematics-SCARArobots-Solvability– Solution methods-Closedformsolution.

UNITIII MANIPULATOR DIFFERENTIAL MOTIONANDSTATICS **9**
Linearandangularvelocities-ManipulatorJacobian-Prismaticandrotaryjoints–Inverse-Wristand armsingularity-Staticanalysis-ForceandmomentBalance.

UNITIV PATHPLANNING **9**
Definition-Joint space technique-Use of p-degree polynomial-Cubic polynomial-Cartesian spacetechnique - Parametric descriptions - Straight line and circular paths - Position and orientation planning.

UNITV DYNAMICSAND CONTROL **9**
Lagrangian mechanics-2DOF Manipulator-Lagrange Euler formulation-Dynamic model – Manipulatorcontrolproblem-Linearcontrolschemes-PIDcontrolscheme-Forcecontrolofrobotic manipulator.

TOTAL:45PERIOD

OUTCOMES:

- Abilityto understandbasicconceptofrobotics.
- ToanalyzeInstrumentationsystemsand their applications to various
- Toknowabout thedifferentialmotion addstaticsin robotics
- Toknowabout thevariouspath planningtechniques.
- Toknowabout thedynamicsandcontrolinrobotics industrie.

TEXTBOOKS:

1.R.K.MittalandI.J.Nagrath,RoboticsandControl,TataMcGrawHill, NewDelhi,4th Reprint, 2005.
2.JohnJ.Craig,Introductionto RoboticsMechanicsand Control,Third edition, PearsonEducation, 2009.
3.M.P.Groover, M.Weiss,R.N.NagelandN. G.Odrej, Industrial Robotics, McGraw-Hill Singapore, 1996.

REFERENCES:

1. AshitavaGhoshal,Robotics-FundamentalConceptsandAnalysis',OxfordUniversityPress, Sixthimpression, 2010.
2. K. K.AppuKuttan, Robotics, IKInternational,2007.
3. EdwinWise,AppliedRobotics, CengageLearning,2003.
4. R.D.Klafter,T.A.Chimielewski and M.Negin, Robotic Engineering–An Integrated Approach, PrenticeHallofIndia,NewDelhi,1994.
5. B.K.Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers,Chennai, 1998.
6. S.Ghoshal, " Embedded Systems &Robotics" – Projects using the 8051 Microcontroller",CengageLearning, 2009.

17153E65B	**SPECIAL ELECTRICALMACHINES**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

Toimpartknowledgeon the followingTopics

- Construction,principleofoperation, controlandperformanceofsteppingmotors.
- Construction,principleofoperation,controlandperformanceofswitchedreluctancemotors.
- Construction, principleofoperation,controlandperformanceofpermanentmagnet brushlessD.C. motors.
- Construction,principle of operation and performance of permanent magnet synchronousmotors.
- Construction,principleofoperation andperformanceofotherspecialMachines.

UNITI STEPPER MOTORS 9

Constructional features –Principle of operation –Types – Torque predictions – Linear Analysis–Characteristics –Drivecircuits–Closed loop control–Conceptofleadangle - Applications.

UNITII SWITCHED RELUCTANCEMOTORS (SRM) 9

Constructional features –Principle of operation- Torque prediction–Characteristics Steadystate performanceprediction–AnalyticalMethod–Powercontrollers–ControlofSRMdrive-Sensor lessoperation ofSRM– Applications.

UNITIII PERMANENTMAGNETBRUSHLESS D.C. MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations- Power Converter Circuits and their controllers - Characteristicsandcontrol-Applications.

UNITIV PERMANENTMAGNETSYNCHRONOUSMOTORS(PMSM) 9

Constructionalfeatures-Principleof operation–EMFandTorqueequations-Sinewavemotor with practical windings - Phasor diagram - Power controllers – performance characteristics - Digitalcontrollers – Applications.

UNITV OTHERSPECIALMACHINES 9

Constructional features – Principle of operation and Characteristics of Hysteresis motor-SynchronousReluctanceMotor–LinearInductionmotor-Repulsion motor-Applications.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto analyzeanddesign controllersforspecialElectricalMachines.
- Abilityto acquiretheknowledgeonconstructionand operation ofsteppermotor.
- Abilitytoacquiretheknowledgeonconstructionandoperationofstepperswitched reluctancemotors.
- Abilitytoconstruction, principleofoperation,switchedreluctancemotors.
- Abilitytoacquiretheknowledgeonconstructionandoperationofpermanentmagnet brushlessD.C. motors.
- Abilitytoacquiretheknowledgeonconstructionandoperationofpermanentmagnet synchronousmotors.
- Abilityto selectaspecialMachineforaparticularapplication.

TEXTBOOKS:

- K.Venkataratnam,‘SpecialElectricalMachines’,UniversitiesPress(India)Private Limited, 2008.
- T. Kenjo,‘SteppingMotorsandTheirMicroprocessor Controls’, Clarendon Press London,1984
- E.G.Janardanan,‘Specialelectricalmachines’,PHIlearningPrivateLimited,Delhi, 2014.

REFERENCES

1. R.Krishnan,‘SwitchedReluctanceMotorDrives–Modeling,Simulation,Analysis, Design andApplication’, CRCPress, NewYork,2001.
2. T. Kenjo and S. Nagamori, ‘Permanent Magnet and Brushless DC Motors’, Clarendon Press,London, 1988.
3. T.J.E.Miller,‘Brushless Permanent-Magnet and Reluctance Motor Drives’, Oxford UniversityPress,1989.
4. R.Srinivasan, ‘SpecialElectricalMachines’,LakshmiPublications, 2013.

17153E65C	**POWERQUALITY**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Causes&Mitigationtechniquesofvarious PQevents.
- VariousActive&Passivepowerfilters.

UNITI INTRODUCTIONTOPOWERQUALITY 9

Terms and definitions &Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustainedinterruption- Sagsandswells-Voltagesag-Voltageswell- Voltageimbalance–Voltage fluctuations-Powerfrequencyvariations-Internationalstandardsofpowerquality –ComputerBusinessEquipmentManufacturersAssociations (CBEMA)curve

UNITII VOLTAGESAGANDSWELL 9

Estimating voltage sag performance - Thevenin’s equivalent source - Analysis and calculation of various faulted condition - Estimation of the sag severity - Mitigation of voltagesag,Statictransferswitchesandfasttransferswitches.-Capacitorswitching– Lightning -Ferro resonance- Mitigation ofvoltage swell.

UNITIII HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources –Power system response characteristics - Harmonics Vs transients. Effect of harmonics – Harmonic distortion -Voltage andcurrent distortions -Harmonicindices-Inter harmonics–Resonance Harmonicdistortion evaluation,IEEEandIECstandards.

UNITIV PASSIVE POWERCOMPENSATORS 9

PrincipleofOperationofPassiveShuntandSeriesCompensators,AnalysisandDesignof Passive Shunt Compensators Simulation and Performance of Passive Power Filters-Limitationsof PassiveFiltersParallelResonanceofPassiveFilterswiththeSupplySystem andItsMitigation. Fundamentalsofloadcompensation–voltageregulation&power factorcorrection.

UNITV POWERQUALITYMONITORING&CUSTOMPOWER DEVICES 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Harmonic / spectrum analyzer - Flickermeters Disturbanceanalyzer-Applicationsofexpertsystemsforpowerqualitymonitoring. Principle&WorkingofDSTATCOM–DSTATCOMinVoltagecontrolmode,currentcontrol mode,DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR -Unifiedpowerquality conditioner.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandvarioussources, causesandeffectsofpowerqualityissues, electricalsystemsand theirmeasuresandmitigation.
- Abilityto analyze thecauses&Mitigation techniquesofvariousPQevents.
- Abilitytostudy aboutthevariousActive&Passivepowerfilters.
- Abilitytounderstand the conceptsaboutVoltageandcurrentdistortions, harmonics.
- Abilitytoanalyze anddesign thepassivefilters.
- Abilitytoacquireknowledgeon compensation techniques.
- Abilitytoacquireknowledgeon DVR.

TEXTBOOKS:

1. Roger. C. Dugan, Mark. F. Mc Granagham, Surya Santoso, H.WayneBeaty, “ElectricalPowerSystemsQuality”, McGrawHill,2003
2. J. Arrillaga,N.R.Watson,S.Chen,“PowerSystemQualityAssessment”, (NewYork: Wiley),2000.
3. BhimSingh,Ambrish Chandra, KamalAl-Haddad,” PowerQualityProblems&MitigationTechniques”Wiley,2015.

REFERENCES

1. G.T.Heydt,“ElectricPowerQuality”,2ndEdition.(WestLafayette,IN,Starsina CirclePublications,1994.
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags and Interruptions”,(NewYork:IEEE Press),2000.

17153E65D **EHVACTRANSMISSION**

L	T	P	C
3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- EHVACTransmission lines
- Electrostaticfield ofAC lines
- Coronain E.H.V.lines

UNITI INTRODUCTION 9

EHVACTransmissionlinetrendsandpreliminary aspect- standardtransmissionvoltages– Estimation at line and ground parameters-Bundle conductors: Properties -Inductance and Capacitance of EHV lines – Positive, negative and zero sequence impedance – Line ParametersforModesofPropagation.

UNITII ELECTROSTATICFIELDS 9

Electrostaticfieldandvoltagegradients–CalculationsofelectrostaticfieldofAClines–Effect of high electrostatic field on biological organisms and human beings - Surfacevoltage gradients and Maximum gradients of actual transmission lines – Voltage gradients on sub conductor.

UNITIII POWERCONTROL 9

Electrostatic induction inun energized lines – Measurement of field and voltage gradientsfor three phase single and double circuit lines – Un energized lines. Power FrequencyVoltage control andovervoltagein EHVlines:No loadvoltage–Charging currentsatpowerfrequency- Voltagecontrol–ShuntandSeriescompensation – Static VARcompensation.

UNITIV CORONAEFFECTSANDRADIOINTERFERENCE 9

Corona in EHV lines – Corona loss formulae-Charge voltage diagram- Attenuation of travelingwavesduetoCorona–AudionoiseduetoCorona,itsgeneration,characteristicand limits.MeasurementsofaudionoiseradiointerferenceduetoCorona-propertiesof radionoise – FrequencyspectrumofRIfields–MeasurementsofRIandRIV.

UNITV STEADYSTATEANDTRANSIENT LIMITS 9

DesignofEHVlinesbasedonsteady stateandtransient limits-EHVcabilitysandtheir characteristics-Introductionsixphasetransmission – UHV.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandtheprinciplesand typesofEHVACsystem.
- Abilityto analyze theelectrostaticfield ofAClines
- Abilityto studyabout thecompensation.
- Abilityto studyabout thecoronain E.H.V.lines
- Abilityto understandtheEHVcabilitys.
- Abilitytoanalyze the steadystateandtransient limits.

TEXTBOOKS:

1. RokoshDasBegamudre, ”ExtraHigh VoltageACTransmission Engineering”–WileyEastern LTD., NEWDELHI1990.

2. S.Rao,“HVAC andHVDCTransmission,EngineeringandPractice” KhannaPublisher, Delhi, 1990.

REFERENCES

1. SubirRay,“AnIntroductiontoHighVoltageEngineering”,PrenticeHallofIndia PrivateLimited, 2013.

2. RD Begamudre, "ExtraHigh VoltageACTransmission Engineering"– NewAcademic ScienceLtd;4edition 2011.
3. Edison,"EHV Transmission line"- ElectricInstitution,GEC, 1968.

17153E65ECOMMUNICATION ENGINEERING LTPC
30 03

OBJECTIVES:

- To introduce the relevance of this course to the existing technology through demonstrations,case studies,simulations,contributionsofscientist,national/internationalpolicieswith afuturisticvisionalong with socio-economic impactandissues
- Tostudythevariousanalog anddigitalmodulation techniques
- Tostudytheprinciplesbehind information theoryandcoding
- Tostudythevariousdigitalcommunicationtechniques

UNITI ANALOGMODULATION 9
AmplitudeModulation–AM,DSBSC,SSBSC,VSB–PSD,modulatorsanddemodulators– Angle modulation –PM and FM–PSD,modulatorsand demodulators– Superheterodyne receivers

UNITII PULSEMODULATION 9
Lowpasssamplingtheorem–Quantization–PAM–Linecoding–PCM,DPCM,DM,andADPCM And ADM,ChannelVocoder-TimeDivisionMultiplexing, FrequencyDivision Multiplexing

UNITIII DIGITALMODULATIONAND TRANSMISSION 9
Phaseshiftkeying–BPSK,DPSK,QPSK–PrinciplesofM-arysignalingM-aryPSK&QAM–Comparison,ISI– Pulseshaping– Duo binaryencoding – Cosinefilters– Eyepattern,equalizers

UNITIV INFORMATIONTHEORYAND CODING 9
Measure of information – Entropy– Source coding theorem – Shannon–Fano coding, Huffman Coding,LZCoding–Channelcapacity–Shannon-Hartleylaw –Shannon'slimit–Errorcontrolcodes –Cycliccodes,Syndromecalculation – Convolution Coding,Sequentialand Viterbidecoding

UNITV SPREADSPECTRUMANDMULTIPLEACCESS 9
PN sequences – properties – m-sequence – DSSS – Processing gain, Jamming – FHSS – Synchronisation andtracking –MultipleAccess– FDMA,TDMA,CDMA,

OUTCOMES:
Attheend ofthecourse,thestudentshould beableto:

- Abilitytocomprehendandappreciatethesignificanceandroleofthiscourseinthepresent contemporaryworld
- Applyanalog anddigitalcommunication techniques.
- Use dataand pulsecommunicationtechniques.
- AnalyzeSourceandErrorcontrolcoding.

TEXTBOOKS:

1. HTaub,DL Schilling,GSaha,“PrinciplesofCommunication Systems” TMH2007
2. S.Haykin “DigitalCommunications”JohnWiley 2005

REFERENCES:

1. B.P.Lathi, “Modern Digitaland AnalogCommunicationSystems”, 3rd edition,Oxford University
2. HP Hsu, SchaumOutlineSeries–“Analog andDigital Communications”TMH2006
3. B.Sklar, Digital Communications Fundamentals and Applications” 2/ePearsonEducation 2007.

17153E75A DISASTER MANAGEMENT LTPC
30 0 3

OBJECTIVES:

- Toprovide studentsan exposure to disasters,theirsignificanceandtypes.
- Toensurethat studentsbeginto understandtherelationship between vulnerability, disasters,disasterprevention andriskreduction
- Togain apreliminaryunderstanding ofapproachesofDisasterRiskReduction(DRR)
- Toenhanceawarenessofinstitutionalprocessesin thecountryand
- Todevelop rudimentaryabilityto respondto theirsurroundingswith potential disaster responsein areaswhere theylive,with duesensitivity

UNITI INTRODUCTIONTODISASTERS 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.-Differentialimpacts-intermsofcaste,class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics,complex emergencies, Climatechange-DosandDon'tsduring varioustypesofDisasters.

UNITII APPROACHES TODISASTER RISKREDUCTION(DRR) 9

Disastercycle-Phases,Cultureofsafety,prevention,mitigationandpreparednesscommunitybasedDRR, Structural-nonstructural measures,Rolesand responsibilitiesof-community, PanchayatiRajInstitutions/Urban LocalBodies(PRIs/ULBs),States,Centre,andotherstake-holders-InstitutionalProcessesandFrameworkat StateandCentralLevel- StateDisasterManagementAuthority(SDMA) –EarlyWarning System–Advisoriesfrom AppropriateAgencies.

UNITIII INTER-RELATIONSHIP BETWEEN DISASTERSAND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments,changesinLand-useetc.-ClimateChangeAdaptation-IPCCScenarioandScenariosin the contextofIndia- Relevance of indigenous knowledge, appropriate technology and local resources.

UNITIV DISASTER RISKMANAGEMENTININDIA 9

HazardandVulnerabilityprofileofIndia,ComponentsofDisasterRelief:Water,Food,Sanitation,Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness,DisasterManagementActandPolicy- Otherrelatedpolicies,plans,programmesandlegislation – Role of GIS and Information Technology Components in Preparedness, RiskAssessment, ResponseandRecoveryPhasesofDisaster– Disaster DamageAssessment.

UNITV DISASTERMANAGEMENT:APPLICATIONSANDCASESTUDIESANDFIELD 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, ManMade disasters:CaseStudies,SpaceBasedInputsforDisasterMitigationandManagementandfield works related to disastermanagement.

TOTAL:45 PERIODS

OUTCOMES:

Thestudentswillbeabilityto

- Differentiatethe typesof disasters,causesand their impactonenvironmentandsociety
- Assessvulnerabilityandvariousmethodsofriskreductionmeasuresaswellasmitigation.

- Drawthehazardandvulnerabilityprofileof India,Scenariousinthe Indiancontext,Disasterdamage assessment andmanagement.

TEXTBOOKS:

1. SinghalJ.P."DisasterManagement",LaxmiPublications,2010.ISBN-10:9380386427ISBN-13: 978-9380386423
2. TusharBhattacharya,"DisasterScienceandManagement",McGrawHillIndiaEducation Pvt.Ltd., 2012.ISBN-10:1259007367,ISBN-**13:**978-1259007361]
3. GuptaAnilK,SreejaS.Nair. EnvironmentalKnowledgeforDisasterRiskManagement,NIDM, New Delhi,2011
4. KapurAnuVulnerabilityIndia:AGeographicalStudy ofDisasters,IIASandSagePublishers,New Delhi,2010.

REFERENCES

1. Govt.ofIndia:DisasterManagementAct, GovernmentofIndia,New Delhi, 2005
2. GovernmentofIndia, NationalDisasterManagementPolicy,2009.

17153E75B HUMAN RIGHTS LTPC
30 03

OBJECTIVES :

- Tosensitize theEngineeringstudents tovariousaspectsofHuman Rights.

UNITI 9

HumanRights–Meaning,originandDevelopment. Notion and classification of Rights – Natural, Moral and Legal Rights. Civil and Political Rights, Economic, Social andCultural Rights; collective / SolidarityRights.

UNITII 9

EvolutionoftheconceptofHumanRightsMaganacarta–Genevaconventionof1864. Universal Declaration ofHuman Rights,1948.TheoriesofHuman Rights.

UNITIII 9

Theoriesand perspectivesofUNLaws– UNAgenciesto monitorandcompliance.

UNITIV 9

Human Rights inIndia–ConstitutionalProvisions/ Guarantees.

UNITV 9

Human Rights of Disadvantaged People – Women, Children, Displaced persons and Disabilitydpersons, includingAgedandHIVInfectedPeople. ImplementationofHumanRights–NationalandStateHuman RightsCommission– Judiciary –RoleofNGO's,Media,EducationalInstitutions,SocialMovements.

TOTAL:45 PERIODS

OUTCOME:

- Engineering studentswillacquirethebasicknowledgeofhuman rights.

REFERENCES:

1. KapoorS.K.,“HumanRightsunderInternationallawandIndianLaws”,CentralLawAgency, Allahabad,2014.
2. ChandraU.,“Human Rights”,AllahabadLawAgency,Allahabad,2014.
3. UpendraBaxi,TheFutureofHuman Rights,Oxford UniversityPress,New Delhi.

17153E75COPERATIONS RESEARCH

L	T	P	C
3	0	0	3

OBJECTIVES:

- To provideknowledgeand trainingin usingoptimization techniquesunder limitedresourcesfor the engineeringand businessproblems.

UNITI LINEARMODELS 15

Thephaseofanoperationresearchstudy–Linearprogramming–Graphicalmethod–Simplexalgorithm –Dualityformulation – Sensitivityanalysis.

UNITII TRANSPORTATIONMODELSAND NETWORKMODELS 8

Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERTnetworks– Criticalpathscheduling– Sequencing models.

UNITIII INVENTORYMODELS 6

Inventory models – Economic order quantity models – Quantity discount models – Stochasticinventorymodels–Multiproductmodels– Inventorycontrolmodelsinpractice.

UNITIV QUEUEINGMODELS 6

Queueing models - Queueing systems and structures – Notation parameter – Single server andmulti server models – Poisson input – Exponential service – Constant rate service – Infinitepopulation – Simulation.

UNITV DECISIONMODELS 10

Decisionmodels–Gametheory–Twopersonzerosumgames–Graphicalsolution-Algebraicsolution– Linear Programming solution – Replacement models – Models based on service life–Economic life– Single / Multi variability search technique – Dynamic Programming – SimpleProblem.

TOTAL:45 PERIODS

OUTCOMES:

- Uponcompletionofthiscourse,thestudentscanabilitytousetheoptimizationtechniquesforuse engineeringandBusinessproblems

TEXTBOOK:

1. HillierandLibeberman,“OperationsResearch”,HoldenDay,2005
2. TahaH.A.,“OperationsResearch”,Sixth Edition,PrenticeHallofIndia,2003.

REFERENCES:

1. BazaraM.J.,JarvisandSheraliH.,“LinearProgrammingandNetworkFlows”,JohnWiley, 2009.

2. BudnickF.S., “PrinciplesofOperationsResearchforManagement”, Richard DIrwin,1990.
3. Philip D.T.andRavindran A., “OperationsResearch”, JohnWiley,1992.
4. ShennoyG.V.andSrivastavaU.K.,“OperationResearchforManagement”,WileyEastern, 1994.
5. TulsianandPasdeyV.,“QuantitativeTechniques”,Pearson Asia,2002.

17153E75D **PROBABILITYAND STATISTICS** **L T P C**
3 0 0 3

OBJECTIVES :

- Thiscourseaimsatprovidingtherequiredskilltoapplythestatisticaltoolsinengineering problems.
- Tointroducethebasicconceptsofprobabilityand randomvariables.
- Tointroducethebasicconceptsof two dimensionalrandomvariables.
- Toacquainttheknowledgeof testing ofhypothesisforsmalland large sampleswhich plays an important rolein reallifeproblems.
- Tointroducethebasicconceptsofclassificationsofdesignofexperiments whichplaysvery important rolesinthe field ofagricultureandstatisticalqualitycontrol.

UNITI PROBABILITYANDRANDOM VARIABLES 12
Probability – The axioms of probability – Conditional probability – Baye’s theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric,Uniform,Exponential and Normaldistributions.

UNITII 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 distributedrandomvariables).

UNITIII TESTING OF HYPOTHESIS 12
Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests basedon Normaldistributionforsinglemeananddifferenceofmeans-Testsbasedont,Chi-squareandFdistributions formean,varianceandproportion-Contingencytable(testforindependent)-Goodnessof fit.

UNITIV DESIGN OFEXPERIMENTS 12
OnewayandTwowayclassifications-Completelyrandomizeddesign–Randomizedblockdesign–Latin squaredesign - 2^2 factorialdesign.

UNITV STATISTICAL QUALITY CONTROL `12
Controlchartsformeasurements(XandRcharts)–Controlchartsforattributes(p,candnpcharts)– Tolerance limits- Acceptance sampling.

TOTAL: 60PERIODS

OUTCOMES :
Upon successful completion ofthecourse, studentswillbe able to:

- Understandthefundamentalknowledgeoftheconceptsofprobabilityandhaveknowledgeof standard distributionswhich candescribe real lifephenomenon.
- Understandthebasicconceptsofoneandtwodimensionalrandomvariablesandapplyin engineering applications.
- Applytheconceptoftesting ofhypothesisforsmalland large samplesinreal lifeproblems.
- Applythebasicconceptsofclassificationsofdesignofexperimentsinthefieldofagriculture and statisticalqualitycontrol.
- Havethenotionofsamplingdistributionsandstatisticaltechniquesusedinengineeringand managementproblems.

TEXTBOOKS :

1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", PearsonEducation, Asia,8th Edition, 2015.
2. Milton.J.S.andArnold.J.C.,"IntroductiontoProbabilityandStatistics",TataMcGrawHill,4th Edition,2007.

REFERENCES:

1. Devore.J.L.,"ProbabilityandStatisticsforEngineeringandtheSciences",CengageLearning, New Delhi,8th Edition,2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGrawHillEducationIndia,4th Edition,NewDelhi, 2010.
3. Ross,S.M.,"IntroductiontoProbabilityandStatisticsforEngineersandScientists",3rd Edition, Elsevier, 2004.
4. Spiegel.M.R.,Schiller.J.andSrinivasan,R.A.,"Schaum'sOutlineofTheoryandProblemsof ProbabilityandStatistics",TataMcGrawHillEdition, 2004.
5. Walpole.R.E.,Myers.R.H.,Myers.S.L.andYe.K.,"ProbabilityandStatisticsforEngineersand Scientists",PearsonEducation, Asia,8thEdition,2007.

17153E75E FIBREOPTICSANDLASER INSTRUMENTS LTPC

30 03

AIM

:

Tocontributeto the knowledgeofFibreopticsand LaserInstrumentationanditsIndustrialandMedical Application.

COURSE OBJECTIVES

- Toexpose thestudentsto thebasicconcepts ofopticalfibresand theirproperties.
- Toprovideadequateknowledgeabout theIndustrialapplicationsofopticalfibres.
- Toexpose thestudentsto theLaserfundamentals.
- ToprovideadequateknowledgeaboutIndustrialapplication oflasers.
- ToprovideadequateknowledgeabouthologaphyandMedicalapplicationsofLasers.

UNITI OPTICALFIBRESANDTHEIRPROPERTIES 9

Constructionofopticalfibercable:GuidingmechanisminopticalfiberandBasiccomponentofopticalfiber communication, –Principles of light propagation through a fibre: Total internal reflection,Acceptance angle(θa),NumericalapertureandSkewmode,–Differenttypesoffibresandtheir properties:Singleand multimodefibersandStepindexandgradedindexfibers,– fibrecharacteristics: Mechanicalcharacteristicsand Transmissioncharacteristics,–Absorptionlosses–Scatteringlosses –Dispersion–Connectorsandsplicers–Fibretermination–Opticalsources:LightEmittingDiode (LED), – Opticaldetectors:PIN Diode.

UNITII INDUSTRIALAPPLICATIONOFOPTICALFIBRES 9

Fibreopticsensors:Typesof fiberopticssensor,Intrinsicsensor-Temperature/Pressuresensor,Extrinsic sensors,PhaseModulated FibreOpticSensorandDisplacementsensor(ExtrinsicSensor) – Fibreoptic instrumentationsystem:Measurementofattenuation(by cutbackmethod),Opticaldomainreflectometers,Fiber ScatteringlossMeasurement,FiberAbsorptionMeasurement,Fiberdispersionmeasurements, End reflection methodandNearfieldscanningtechniques – Different types ofmodulators: Electro-optic modulator (EOM) –Interferometric method of measurement of length – Moirefringes– Measurementofpressure, temperature,current,voltage,liquidleveland strain.

UNITIII LASERFUNDAMENTALS 9

Fundamentalcharacteristicsoflasers–LevelLasers:Two-LevelLaser,ThreeLevelLaser,QuasiThreeand four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence andDirectionality and Brightness –Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNITIV INDUSTRIALAPPLICATIONOF LASERS 9

Laserfor measurement of distance, Laser for measurement of length, Laser for measurement ofvelocity, Laserformeasurementofacceleration,Laserformeasurementofcurrent,voltageandLaserformeasurement ofAtmosphericEffect:Typesof LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laserinstrumentation for material processing, Powder Feeder,Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimmingofmaterial:ProcessOfLaserTrimming,TypesOfTrim,ConstructionAndWorking Advantages– MaterialRemovalandvaporization:ProcessOfMaterialRemoval.

UNITV HOLOGRAMANDMEDICALAPPLICATIONS 9

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holographyfor non-destructive testing – Holographiccomponents – Medicalapplicationsof lasers,laser- Tissue Interactions Photochemical reactions, Thermalisation, collisional relaxation, Types ofInteractions andSelectinganInteractionMechanism – Laser instruments for surgery, removal of tumorsofvocal cards,brain surgery, plastic surgery, gynaecologyandoncology.

TOTAL:45 PERIODS

COURSEOUTCOMES(COs):

1.Understand theprinciple, transmission, dispersion and attenuation characteristics ofopticalfibers
2.Applythegainedknowledgeonopticalfibersforitsuseascommunicationmediumandassensoraswell whichhaveimportantapplicationsinproduction,manufacturingindustrialandbiomedicalapplications.
3.Understandlaser theoryandlasergeneration system.
4.StudentswillgainabilitytoapplylasertheoryfortheselectionoflasersforaspecificIndustrialandmedical application.

TEXTBOOKS:

1.J.M.Senior,‘OpticalFibreCommunication–PrinciplesandPractice’, PrenticeHallofIndia,1985.
2.J.WilsonandJ.F.B.Hawkes,‘IntroductiontoOptoElectronics’, PrenticeHallofIndia,2001.
3.EricUdd,WilliamB.,andSpillman,Jr.,“FiberOpticSensors:AnIntroductionforEngineersand Scientists“,JohnWiley&Sons,2011.

REFERENCES:

1.G. Keiser, ‘OpticalFibreCommunication’, McGrawHill,1995.
2. M.Arumugam,‘OpticalFibreCommunication andSensors’, Anuradha Agencies,2002.
3.John F.Ready,“IndustrialApplicationsofLasers”, AcademicPress,Digitized in 2008.

4.MonteRoss,‘LaserApplications’,McGrawHill, 1968.

5.JohnandHarry, “Industriallasersandtheir application”,McGraw-Hill, 2002.

6.Keiser, G.,“OpticalFiberCommunication”, McGraw-Hill, 3rd Edition, 2000. http://nptel.ac.in/courses/117101002/

17153E81A	FLEXIBLEAC TRANSMISSIONSYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Thestart-of-artofthepowersystem
- Performanceofpowersystemswith FACTScontrollers.
- FACTS controllersfor loadflowand dynamicanalysis

UNITI INTRODUCTION 9

Realandreactivepowercontrolinelectricalpower transmissionlines–loads&system compensation-Uncompensated transmissionline–shuntandseriescompensation.

UNITII STATICVAR COMPENSATOR(SVC)ANDAPPLICATIONS 9

Voltage control by SVC–Advantages of slope in dynamic characteristics–Influence of SVCon system voltage–Design of SVC voltage regulator–TCR-FC-TCR-Modeling of SVC forpower flow andfasttransientstability–Applications: Enhancement oftransientstability–Steadystate power transfer–Enhancementofpowersystemdamping.

UNITIII THYRISTOR CONTROLLEDSERIES CAPACITOR(TCSC)AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvementofthe systemstabilitylimit–Enhancementof systemdamping.

UNITIV VOLTAGESOURCECONVERTERBASEDFACTS CONTROLLERS 9

StaticSynchronous Compensator(STATCOM)–Principleofoperation–V-I Characteristics. Applications:Steadystatepowertransfer-enhancementoftransientstability-preventionof voltage instability. SSSC-operation of SSSC and the control of power flow–modelling ofSSSCinload flowandtransientstabilitystudies-Dynamicvoltage restorer(DVR).

UNITV ADVANCED FACTS CONTROLLERS 9

InterlineDVR(IDVR)-UnifiedPowerflowcontroller(UPFC)-Interlinepowerflowcontroller (IPFC)-Unified Powerqualityconditioner(UPQC).

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understand, analyzeanddevelop analyticalmodelofFACTS controllerforpower systemapplication.
- Abilitytounderstand the conceptsaboutloadcompensation techniques.
- Abilitytoacquireknowledgeonfactsdevices.
- Abilitytounderstand thestart-of-artofthepowersystem
- Abilitytoanalyzetheperformanceof steady stateand transientsof factscontrollers.
- Abilitytostudy aboutadvanced FACTScontrollers.

TEXTBOOKS:

1. R.Mohan Mathur, Rajiv K.Varma,“Thyristor–Based Facts Controllers for Electrical Transmission Systems”, IEEEpressandJohnWiley&Sons,Inc,2002.
2. NarainG.Hingorani,“UnderstandingFACTS-ConceptsandTechnologyofFlexibleAC Transmission Systems”,Standard PublishersDistributors,Delhi-110006,2011.
3. T.J.EMiller,PowerElectronicsin powersystems, JohnWileyand sons.

REFERENCES

1. K.R.Padiyar,"FACTSControllersinPowerTransmissionandDistribution",NewAge International(P)Limited, Publishers,NewDelhi,2008
2. A.T.John,"FlexibleA.C.TransmissionSystems",InstitutionofElectricalandElectronic Engineers(IEEE),1999.
3. V.K.Sood,HVDCandFACTScontrollers–ApplicationsofStaticConvertersinPower System,APRIL2004,KluwerAcademicPublishers,2004.

SOFTCOMPUTINGTECHNIQUES

17153E81B

L	T	P	C
3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Basicsofartificialneuralnetwork.
- Conceptsofmodellingand controlofneuralandfuzzycontrolschemes.
- Featuresofhybrid controlschemes.

UNITI ARTIFICIAL NEURALNETWORK 9

Reviewoffundamentals–Biologicalneuron,artificialneuron,activationfunction,single layer perceptron – Limitation – Multi layer perceptron – Back Propagation Algorithm(BPA) – RecurrentNeuralNetwork(RNN)–AdaptiveResonanceTheory(ART)basednetwork–Radial basis function network – online learning algorithms, BP through time –RTRLalgorithms– Reinforcement learning.

UNITII NEURAL NETWORKS FORMODELINGANDCONTROL 9

Modelling of non-linear systems using ANN – Generation of training data – Optimal architecture– Model validation – Control of non-linear systems using ANN – Direct and indirect neuro control schemes – Adaptive neuro controller – Familiarization with neural networktoolbox.

UNITIII FUZZYSETTHEORY 9

Fuzzy set theory – Fuzzy sets – Operation on fuzzy sets – Scalar cardinality, fuzzy cardinality,unionand intersection,complement(YagerandSugeno),equilibrium points, aggregation, projection, composition, cylindrical extension, fuzzy relation – Fuzzy membership functions.

UNITIV FUZZYLOGIC FORMODELINGANDCONTROL 9

Modellingofnon-linearsystemsusing fuzzymodels–TSKmodel–Fuzzy logiccontroller –Fuzzification–Knowledgebase–Decisionmakinglogic–Defuzzification–Adaptive fuzzy systems– Familiarizationwithfuzzylogic toolbox.

UNITV HYBRID CONTROLSCHEMES 9

FuzzificationandrulebaseusingANN–Neurofuzzysystems–ANFIS–Fuzzyneuron– GA – Optimization of membership function and rule base using Genetic Algorithm –Introduction to other evolutionary optimization techniques, support vector machine– Case study – Familiarizationwith ANFIS toolbox.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilitytounderstand the conceptsofANN, different featuresoffuzzylogicand their modelling, controlaspectsanddifferenthybridcontrolschemes.
- Abilityto understandthebasicsofartificialneuralnetwork.
- Abilityto getknowledge onmodellingandcontrolofneural.
- Abilityto getknowledge onmodellingandcontroloffuzzycontrolschemes.
- Abilityto acquireknowledgeon hybrid controlschemes.
- Abilityto understandtheconcepts ofAdaptiveResonanceTheory

TEXTBOOKS:

1. LaurenceFausett,"FundamentalsofNeuralNetworks",PrenticeHall,Englewood Cliffs, N.J., 1992
2. TimothyJ.Ross,"FuzzyLogicwithEngineeringApplications",McGrawHillInc., 2000.

REFERENCES

1. Goldberg, "Genetic Algorithm in Search, Optimization and Machine learning", AddisonWesleyPublishingCompanyInc. 1989
2. MillonW.T.,SuttonR.S.andWebroseP.J.,"NeuralNetworksforControl",MIT press,1992
3. Ethem Alpaydin, "Introduction to Machine learning (Adaptive Computation and MachineLearningseries)', MITPress,Second Edition, 2010.
4. Zhang Huaguang and Liu Derong, "Fuzzy Modeling and Fuzzy Control Series:Control Engineering", 2006

17153E81C **POWER SYSTEMS DYNAMICS** **L T P C**
3 0 0 3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Basicsofdynamicsandstabilityproblems
- Modeling ofsynchronousmachines
- Excitation systemand speed-governingcontrollers.
- Smallsignalstabilityofasingle-machineinfinitebussystemwithexcitationsystemand power systemstabilizer.
- Transient stability simulation ofmultimachinepower system.

UNITI INTRODUCTION 9

Basicsofsystemdynamics–numericaltechniques–introductiontosoftwarepackagesto studythe responses. Concept and importance of power system stability in the operationand design - distinction between transient and dynamic stability - complexity of stabilityproblem in large system – necessity for reduced models - stability of interconnectedsystems.

UNITII SYNCHRONOUS MACHINEMODELLING 9

Synchronousmachine- fluxlinkageequations-Park's transformation-perunitconversion -normalizingtheequations-equivalentcircuit-currentspacemodel-fluxlinkagestatespace model. Sub-transientandtransientinductances-timeconstants.Simplifiedmodels(oneaxisand constantfluxlinkage)-steadystateequationsand phasordiagrams.

UNITIII MACHINE CONTROLLERS 9

Exciterandvoltageregulators-functionandtypesofexcitationsystems-typicalexcitation system configuration - block diagram and state space representation of IEEE type 1 excitationsystem -saturationfunction-stabilizingcircuit.Functionofspeedgoverningsystems -block diagram and state space representation of IEEE mechanical hydraulicgovernorandelectricalhydraulic governorsforhydro turbinesandsteamturbines.

UNITIV TRANSIENTSTABILITY 9

Stateequation formultimachinesystemwithoneaxismodelandsimulation–modellingofmulti machine power system with one axis machine model including excitation system and speed governing system andsimulationusingR-Kmethodoffourthorder(Gill'stechnique)fortransient stabilityanalysis-powersystemstabilizer.Forallsimulations,thealgorithmandflowcharthave to bediscussed.

UNITV DYNAMICSTABILITY 9

Systemresponsetosmalldisturbances-linearmodel of theunregulatedsynchronousmachine anditsmodesof oscillation -regulated synchronousmachine -distributionofpowerimpact-linearizationoftheloadequationfortheonemachineproblem–simplified linearmodel-effectof excitationondynamicstability-approximatesystemrepresentation - supplementary stabilizing signals - dynamic performance measure - small signal performancemeasures.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandand analyzepowersystemoperation,stability,controland protection.
- Abilityto getknowledge on thebasicsofdynamicsandstabilityproblems
- Abilitytodesignandmodellingofsynchronousmachines

- Abilitytostudy aboutexcitation systemandspeed-governingcontrollers.
- Abilitytounderstandtheconceptofsmallsignalstabilityofasingle-machineinfinitebus system with excitation system.
- Abilitytoanalyze the transientstability simulation.

TEXTBOOKS:

1. P.M. Anderson and A.A.Fouad, ‘Power System Control and Stability’, Galgotia Publications,New Delhi,2003.
2. P.Kundur, ‘PowerSystemStabilityandControl’, McGrawHillInc., USA,1994.
3. R.Ramanujam, “PowerSystem Dynamics– Analysisand Simulation”, PHI, 2009.

REFERENCES

1. M.A.PaiandW.Sauer,‘PowerSystemDynamicsandStability’,PearsonEducation Asia, India, 2002.
2. James A.Momoh, Mohamed. E. EI-Hawary. “ Electric Systems, Dynamics and Stability withArtificialIntelligenceapplications”,MarcelDekker,USAFirstEdition, 2000.
3. C.A.Gross, “PowerSystemAnalysis,”Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac,” Electric Power Systems”,Wiley India,2013.
5. K.Umarao,“ComputerTechniquesandModelsinPowerSystem,”I.K.International, 2007.

17153E81D	SMPSANDUPS	L	T	P	C
		3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Modern powerelectronicconvertersanditsapplications in electricpowerutility.
- Resonantconvertersand UPS

UNITI DC-DCCONVERTERS 9

Principlesofstepdownandstepupconverters–Analysisandstatespacemodelingof Buck,Boost, Buck-Boostand Cukconverters.

UNITII SWITCHED MODEPOWER CONVERTERS 9

Analysisandstatespacemodelingof fly back,Forward,Pushpull,Luo,Halfbridgeandfullbridge converters-controlcircuitsand PWMtechniques.

UNITIII RESONANT CONVERTERS 9

Introduction-classification-basicconcepts-Resonant switch-Load Resonantconverters-ZVS, Clampedvoltagetopologies-DClinkinverterswithZeroVoltageSwitching-Series andparallel Resonantinverters-Voltagecontrol.

UNITIV DC-AC CONVERTERS 9

Singlephaseandthreephaseinverters,controlusingvarious(sinePWM,SVPWMand PSPWM) techniques, various harmonic elimination techniques- Multilevel inverters- Concepts- Types: Diode clamped- Flying capacitor- Cascadedtypes- Applications.

UNITV POWERCONDITIONERS,UPS &FILTERS 9

Introduction-Power linedisturbances-Powerconditioners–UPS:offline UPS,OnlineUPS, Applications – Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors,filterforPWMVSI,currentfilter,DCfilters–Designofinductorandtransformerfor PE applications– Selection ofcapacitors.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilitytoanalyze the statespacemodelforDC–DCconverters
- Abilityto acquireknowledgeon switched modepowerconverters.
- Abilityto understandtheimportanceofResonantConverters.
- Abilityto analyze thePWMtechniques forDC-ACconverters
- Abilityto acquireknowledgeon modern powerelectronicconvertersanditsapplicationsin electricpowerutility.
- Abilitytoacquireknowledgeonfilters and UPS

TEXTBOOKS:

1. Simon Ang, AlejandroOliva,”Power-SwitchingConverters”,Third Edition, CRC Press, 2010.
2. KjeldThorborg,“PowerElectronics– In theoryand Practice”,Overseas Press, First Indian Edition 2005.
3. M.H.Rashid– PowerElectronicshandbook,ElsevierPublication, 2001.

REFERENCES

1. PhilipTKrein, “ElementsofPowerElectronics”,Oxford UniversityPress
2. Ned Mohan,Tore.M.Undeland,William.P.Robbins, PowerElectronicsconverters,

Applicationsand design-Third Edition-JohnWileyand Sons-2006
3. M.H.Rashid– PowerElectronics circuits, devicesandapplications-thirdedition PrenticeHallofIndiaNewDelhi,2007.
4. Erickson,RobertW,“FundamentalsofPowerElectronics”, Springer, secondedition, 2010.

		L	T	P	C
17153E81E	**ELECTRIC ENERGYGENERATION,UTILIZATION CONSERVATION**	**3**	**0**	**0**	**3**

OBJECTIVES:
Toimpartknowledgeon the followingTopics

- Tostudythegeneration,conservation ofelectricalpowerand energy efficientequipments.
- Tounderstand theprinciple,design ofillumination systemsandenergy efficiencylamps.
- Tostudythemethodsofindustrialheating andwelding.
- Tounderstand theelectrictractionsystemsand theirperformance.

UNITI ILLUMINATION 9
Importanceoflighting–propertiesofgoodlightingscheme–lawsofillumination–photometry-types of lamps – lighting calculations –basicdesign of illuminationschemesforresidential,commercial, streetlighting,factorylightingandfloodlighting–LEDlightingandenergyefficient lamps.

UNITII REFRIGERATIONANDAIR CONDITIONING 9
Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Various types of air-conditioning system and their applications, smart air conditioning units - EnergyEfficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, DirectSavings andpaybackanalysis,efficiencyevaluationfactor.

UNITIII HEATINGANDWELDING 9
Roleofelectricheatingforindustrialapplications–resistanceheating–inductionheating– dielectric heating - electric arc furnaces. Brief introduction to electric welding – weldinggenerator, welding transformerandthecharacteristics.

UNITIV TRACTION 9
Merits of electric traction – requirements of electric traction system – supply systems – mechanicsoftrainmovement–tractionmotorsandcontrol–braking–recenttrendsinelectrictraction.

UNITV DOMESTIC UTILIZATIONOF ELECTRICALENERGY 9
Domesticutilizationofelectricalenergy–Housewiring.Inductionbasedappliances,OnlineandOFF lineUPS,Batteries-Power qualityaspects–nonlinear anddomesticloads–Earthing–Domestic, IndustrialandSubstation.

TOTAL:45 PERIODS

OUTCOMES:
- Tounderstand themainaspects ofgeneration,utilizationandconservation.
- Toidentifyanappropriatemethod ofheatingforany particular industrialapplication.
- Toevaluatedomesticwiring connection anddebuganyfaultsoccurred.
- Toconstructanelectricconnectionforanydomesticappliancelikerefrigeratoraswellasto design abattery chargingcircuitforaspecifichousehold application.

- To realize the appropriate type of electric supply system as well as to evaluate the performanceofatractionunit.
- Tounderstand themainaspects ofTraction.

TEXTBOOKS:

1. Wadhwa,C.L.“Generation,DistributionandUtilizationofElectricalEnergy”,NewAge InternationalPvt. Ltd,2003.
2. Dr.UppalS.L.andProf.S.Rao,'ElectricalPowerSystems',KhannaPublishers,New Delhi,15th Edition, 2014.
3. EnergyEfficiencyinElectricUtilities, BEE GuideBook,2010

REFERENCES

1. Partab.H,“ArtandScienceofUtilisationofElectricalEnergy”,DhanpatRaiandCo,New Delhi,2004.
2. OpenshawTaylor.E, “Utilization ofElectricalEnergyin SIUnits”, OrientLongman Pvt. Ltd, 2003.
3. Gupta.J.B,“UtilizationofElectricPowerandElectricTraction”,S.K.KatariaandSons, 2002.
4. CleanerProduction –EnergyEfficiencyManualforGERIAP, UNEP,Bangkokprepared by NationalProductivityCouncil.

17153E81F	**PROFESSIONAL ETHICS INENGINEERING**	**LTPC**
		30 03

OBJECTIVES:

- Toenable the studentsto createanawarenesson EngineeringEthicsandHuman Values, toinstill MoralandSocialValuesandLoyaltyand to appreciatetherights ofothers.

UNITI HUMANVALUES 10

Morals,valuesandEthics–Integrity–Workethic–Servicelearning–Civicvirtue–Respectforothers– Livingpeacefully–Caring–Sharing–Honesty–Courage–Valuingtime–Cooperation–Commitment – Empathy – Self confidence – Character – Spirituality – Introduction to Yoga and meditation for professionalexcellenceandstressmanagement.

UNITII ENGINEERINGETHICS 9

Sensesof ‘EngineeringEthics’–Varietyofmoralissues–Typesof inquiry– Moraldilemmas–Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Models of professionalroles-Theoriesabout right action–Self-interest –CustomsandReligion–UsesofEthical Theories.

UNITIII ENGINEERINGAS SOCIAL EXPERIMENTATION 9

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

UNITIV SAFETY, RESPONSIBILITIESANDRIGHTS 9

SafetyandRisk–Assessment of SafetyandRisk –RiskBenefitAnalysisandReducingRisk -Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – OccupationalCrime– Professional Rights–EmployeeRights–IntellectualPropertyRights (IPR)– Discrimination.

UNITV GLOBALISSUES 8

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –Moral Leadership –CodeofConduct–CorporateSocialResponsibility.

TOTAL:45 PERIODS

OUTCOMES:

- Uponcompletionofthecourse,thestudentshouldbeabilitytoapply ethics insociety,discusstheethical issuesrelated toengineeringand realize the responsibilitiesandrightsin thesociety.

TEXTBOOKS:

1.MikeW. Martin andRolandSchinzinger, “EthicsinEngineering”,TataMcGrawHill,NewDelhi, 2003.
2.Govindarajan M,Natarajan S,SenthilKumarV.S,“EngineeringEthics”, PrenticeHallofIndia,New Delhi,2004.

REFERENCES:

1.CharlesB. Fleddermann,“Engineering Ethics”,PearsonPrenticeHall, NewJersey, 2004.
2.CharlesE.Harris,MichaelS.PritchardandMichaelJ.Rabins,“EngineeringEthics–Conceptsand Cases”, CengageLearning,2009.
3.John R Boatright, “EthicsandtheConductofBusiness”, PearsonEducation, NewDelhi,2003
4.EdmundGSeebauerandRobertLBarry,“FundamentalsofEthicsforScientistsandEngineers”, Oxford UniversityPress, Oxford, 2001.
5.LauraP.HartmanandJoeDesjardins,“BusinessEthics:DecisionMakingforPersonalIntegrityand Social Responsibility”McGrawHilleducation, IndiaPvt.Ltd.,NewDelhi,2013.
6.World CommunityServiceCentre, ‘ValueEducation’, Vethathiripublications,Erode, 2011.

Web sources:

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

17153E81G PRINCIPLES OFMANAGEMENT LTPC

30 03

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles ofmanagement and tolearn theapplication oftheprinciplesin an organization.

UNITI INTRODUCTION TOMANAGEMENTANDORGANIZATIONS 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- publicandprivatesectorenterprises- OrganizationcultureandEnvironment–Currenttrends and issuesin Management.

UNITII PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives –policies–Planningpremises–StrategicManagement–PlanningToolsandTechniques –Decision makingstepsand process.

UNITIII ORGANISING 9

Natureandpurpose–Formalandinformalorganization–organizationchart–organizationstructure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection,TrainingandDevelopment,PerformanceManagement,Careerplanning andmanagement.

UNITIV 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 andIT.

UNITV CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use ofcomputers andITinManagementcontrol–Productivityproblemsandmanagement–controlandperformance–direct andpreventivecontrol– reporting.

OUTCOMES: **TOTAL:45PERIODS**

- Upon completion of the course, students will be ability to have clear understanding of managerial functions like planning, organizing, staffing, leading &controlling and have same basic knowledgeoninternationalaspectofmanagement

TEXTBOOKS:

1. JAF Stoner, Freeman R.E and Daniel R Gilbert “Management”, 6th Edition, Pearson Education,2004.
2. StephenP.Robbins&Mary Coulter, “Management”,PrenticeHall (India)Pvt.Ltd.,10th Edition, 2009.

REFERENCES:

1. HaroldKoontz& HeinzWeihrich, “EssentialsofManagement”,TataMcGrawHill,1998.
2. RobertKreitner&MamataMohapatra,“Management”,Biztantra,2008.
3. StephenA.Robbins&DavidA.Decenzo&MaryCoulter,“FundamentalsofManagement”, 7th Edition,Pearson Education,2011.
4. TripathyPC& ReddyPN,“PrinciplesofManagement”,TataMcgrawHill,1999

17153E82A **ENERGY MANAGEMENTANDAUDITING**

L	T	P	C
3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- Toimpactconceptsbehind economicanalysisand Loadmanagement.
- Energymanagementonvariouselectricalequipmentsand metering.
- Conceptoflighting systemsandcogeneration.

UNITI INTRODUCTION 9

Basics of Energy – Need for energy management – Energy accounting - Energy monitoring, targetingandreporting - Energyauditprocess.

UNITII ENERGYMANAGEMENTFORMOTORSANDCOGENERATION 9

Energy management for electric motors – Transformer and reactors - Capacitors and synchronous machines, energy management by cogeneration – Forms of cogeneration – Feasibility ofcogeneration – Electricalinterconnection.

UNITIII LIGHTINGSYSTEMS 9

Energymanagementinlightingsystems–Taskandtheworkingspace-Lightsources–Ballasts – Lighting controls – Optimizing lighting energy – Power factor and effect ofharmonics, lighting and energystandards.

UNITIV METERINGFORENERGYMANAGEMENT 9

Metering for energy management – Units of measure - Utility meters – Demand meters – Parallelingofcurrenttransformers–Instrumenttransformerburdens–Multitaskingsolidstate meters, metering location vs requirements, metering techniques and practicalexamples.

UNITV ECONOMICANALYSISANDMODELS 9

Economicanalysis–Economicmodels-Timevalueofmoney-Utilityratestructures– Costof electricity – Loss evaluation, load management – Demand control techniques – Utility monitoring and control system – HVAC and energy management – Economicjustification.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilitytounderstand the basicsofEnergyauditprocess.
- Abilityto understandthebasicsofenergymanagementbycogeneration Abilityto
- acquireknowledgeon Energymanagementinlightingsystems Abilityto
- impactconceptsbehind economicanalysisand Load management.
- AbilitytounderstandtheimportanceofEnergymanagementonvariouselectrical equipmentandmetering.
- Abilityto acquireknowledgeon HVAC.

TEXTBOOKS:

1. BarneyL.Capehart,WayneC.Turner,andWilliamJ.Kennedy,GuidetoEnergy Management, FifthEdition,TheFairmontPress,Inc., 2006
2. EastopT.D&CroftD.R,EnergyEfficiencyforEngineersandTechnologists,.Logman Scientific&Technical, ISBN-0-582-03184 , 1990.

REFERENCES

1. ReayD.A,IndustrialEnergyConservation,1st edition, Pergamon Press,1977.
2. IEEERecommendedPracticeforEnergyManagementinIndustrialandCommercial Facilities, IEEE, 196.
3. AmitK.Tyagi, Handbookon EnergyAuditsandManagement,TERI, 2003.
4. Electricityin buildingsgood practiceguide,McGraw-HillEducation, 2016.
5. NationalProductivityCouncilGuideBooks

17153E82B **DATASTRUCTURES** **LTP C 30 0 3**

OBJECTIVES:

- Tounderstand theconcepts ofADTs
- ToLearnlineardatastructures–lists,stacks, andqueues
- Tounderstand sorting,searchingandhashingalgorithms
- ToapplyTreeandGraph structures

UNITI LINEARDATASTRUCTURES– LIST 9

AbstractDataTypes(ADTs)–ListADT–array-basedimplementation–linkedlistimplementation—singly linked lists-circularly linked lists- doubly-linked lists – applications of lists –PolynomialManipulation –Alloperations (Insertion, Deletion,Merge, Traversal).

UNITII LINEARDATASTRUCTURES– STACKS,QUEUES 9

StackADT–Operations-Applications-Evaluatingarithmeticexpressions-ConversionofInfixto postfix expression -Queue ADT – Operations - Circular Queue – Priority Queue - deQueue –applicationsof queues.

UNITIII NON LINEAR DATASTRUCTURES– TREES 9

TreeADT–treetraversals-BinaryTreeADT–expressiontrees–applicationsoftrees–binarysearch treeADT–ThreadedBinaryTrees-AVLTrees–B-Tree- B+Tree-Heap–Applicationsofheap.

UNITIV NON LINEAR DATASTRUCTURES- GRAPHS 9

Definition – Representation of Graph – Types of graph - Breadth-first traversal - Depth-first traversal – TopologicalSort– Bi-connectivity– Cutvertex–Eulercircuits– Applicationsofgraphs.

UNITV SEARCHING,SORTINGANDHASHINGTECHNIQUES 9

Searching-LinearSearch-BinarySearch.Sorting-Bubblesort-Selectionsort-Insertionsort-Shellsort–Radix sort. Hashing- Hash Functions – Separate Chaining – Open Addressing – Rehashing –Extendible Hashing.

TOTAL:45PERIODS

OUTCOMES:

Attheend ofthecourse,thestudentshould beableto:

- Implementabstractdata typesfor lineardata structures.
- Applythedifferent linearandnon-lineardata structures toproblemsolutions.
- Criticallyanalyze thevarious sorting algorithms.

TEXTBOOKS:

1. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education,1997.
2. ReemaThareja, “DataStructuresUsingC”, SecondEdition ,Oxford UniversityPress,2011

REFERENCES:

1.ThomasH.Cormen,CharlesE.Leiserson, Ronald L.Rivest,Clifford Stein, "Introductionto Algorithms", SecondEdition,Mcgraw Hill, 2002.
2.Aho, HopcroftandUllman, "DataStructures and Algorithms",PearsonEducation,1983.
3.StephenG. Kochan,"Programming in C", 3rdedition,PearsonEducation.
4.EllisHorowitz,SartajSahni,Susan Anderson-Freed, "Fundamentals ofDataStructuresin C", Second Edition,UniversityPress,2008

17153E82C	HIGHVOLTAGE DIRECT CURRENT TRANSMISSION	L	T	P	C
		3	0	0	3

OBJECTIVES: Toimpartknowledgeaboutthefollowing topics:

- Planning ofDCpowertransmission andcomparisonwith ACpower transmission.
- HVDCconverters.
- HVDCsystemcontrol.
- Harmonicsanddesignoffilters.
- Powerflowin HVDCsystemundersteadystate.

UNITI INTRODUCTION 9

DCPowertransmissiontechnology–ComparisonofACandDCtransmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems–HVDC transmission based onVSC–TypesandapplicationsofMTDCsystems.

UNITII ANALYSIS OFHVDCCONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number–Choiceofconverterconfiguration–Converterbridgecharacteristics–Analysisofa12 pulseconverters– AnalysisofVSCtopologiesandfiring schemes.

UNITIII CONVERTERANDHVDCSYSTEMCONTROL 9

PrinciplesofDClinkcontrol–Convertercontrolcharacteristics–Systemcontrolhierarchy– Firing anglecontrol– Currentandextinction anglecontrol–Starting andstopping ofDClink –Powercontrol–Higherlevelcontrollers–ControlofVSCbasedHVDClink.

UNITIV REACTIVE POWERANDHARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–SVC and STATCOM– Generationofharmonics–Design ofACandDCfilters– Activefilters.

UNITV POWERFLOWANALYSIS INAC/DCSYSTEMS 9

PerunitsystemforDCquantities–DCsystemmodel–Inclusionofconstraints–Powerflowanalysis –casestudy

TOTAL: 45 PERIODS

OUTCOMES:

- Abilityto understandtheprinciplesand typesofHVDCsystem. Abilityto
- analyzeandunderstandtheconceptsofHVDCconverters. Abilityto
- acquireknowledgeon DC linkcontrol.
- Abilitytounderstandtheconceptsofreactivepowermanagement,harmonicsand

powerflowanalysis.

- AbilitytogetknowledgeaboutPlanningofDCpowertransmissionandcomparisonwith ACpower transmission.
- AbilitytounderstandtheimportanceofpowerflowinHVDCsystemundersteady state.

TEXTBOOKS:

1. Padiyar,K.R.,"HVDC power transmission system", New Age International(P)Ltd. NewDelhi, SecondEdition,2010.
2. Arrillaga,J.,"High Voltage Direct Current Transmission", Peter Pregrinus, London,1983.

REFERENCES

1. KundurP.," PowerSystemStabilityandControl",McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG," High Voltage Direct Current Power Transmission", GarrawayLimited,London,1960.
3. EdwardWilsonKimbark,"DirectCurrentTransmission",Vol.I,Wileyinterscience, New York, London, Sydney,1971.

17153E82D	**MICROCONTROLLERBASEDSYSTEM DESIGN**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- ArchitectureofPICmicrocontroller
- Interruptsandtimers
- Peripheraldevicesfordatacommunication andtransfer
- FunctionalblocksofARMprocessor
- ArchitectureofARMprocessors

UNITI INTRODUCTIONTOPICMICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–IC16cxx–- Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressingmodes– SimpleOperations.

UNITII INTERRUPTSANDTIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine Timers-Timer Programming– Front panel I/O-Soft Keys– State machines andkey switches– DisplayofConstantandVariabilitystrings.

UNITIII PERIPHERALSANDINTERFACING 9

I^2CBusforPeripheralsChipAccess–Busoperation-Bussubroutines–SerialEEPROM— Analog toDigitalConverter–UART-Baudrateselection–Datahandlingcircuit–Initialization-LCDandkeyboard Interfacing -ADC,DAC, andSensorInterfacing.

UNITIV INTRODUCTIONTOARMPROCESSOR 9

Architecture–ARMprogrammer'smodel–ARMDevelopmenttools-MemoryHierarchy– ARM Assembly Language Programming–Simple Examples–Architectural Support for

Operatingsystems.

UNITV ARMORGANIZATION 9

3-StagePipelineARM Organization–5-StagePipelineARMOrganization–ARMInstruction Execution-ARM Implementation– ARM Instruction Set– ARM coprocessor interface–ArchitecturalsupportforHigh LevelLanguages–EmbeddedARMApplications.

TOTAL: 45 PERIODS

OUTCOMES:

- Abilitytounderstandandapplycomputingplatformandsoftwareforengineering problems.
- Abilityto understandtheconcepts ofArchitectureofPICmicrocontroller
- Abilityto acquireknowledgeon Interruptsand timers.
- Abilityto understandtheimportanceofPeripheraldevicesfordatacommunication.
- Abilityto understandthebasicsofsensor interfacing
- Abilityto acquireknowledge in ArchitectureofARMprocessors

TEXTBOOKS:

1. Peatman,J.B., "Design with PIC Micro Controllers"PearsonEducation,3rdEdition, 2004.
2. Furber,S., "ARMSystemon Chip Architecture" AddisonWesleytrade Computer Publication, 2000.

REFERENCES

1. Mazidi,M.A.,"PIC Microcontroller"Rollin Mckinlay,Dannycausey,Prentice Hallof India,2007.

17153E82E	SMARTGRID	L	T	P	C
		3	0	0	3

OBJECTIVES: Toimpartknowledgeabout thefollowing topics:

- SmartGrid technologies,differentsmartmetersand advancedmetering infrastructure.
- Thepowerquality managementissuesin Smart Grid.
- Thehigh performancecomputingforSmart Gridapplications

UNITI INTRODUCTIONTOSMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities,challengesandbenefits,Differencebetweenconventional &SmartGrid, NationalandInternationalInitiatives in SmartGrid.

UNITII SMART GRIDTECHNOLOGIES 9

TechnologyDrivers, Smartenergyresources,Smartsubstations,Substation Automation,Feeder Automation,Transmissionsystems:EMS,FACTSandHVDC,Wideareamonitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation andservice restoration, Outage management,High-Efficiency DistributionTransformers, PhaseShiftingTransformers, Plugin Hybrid ElectricVehicles(PHEV).

UNITIII SMARTMETERSANDADVANCED METERINGINFRASTRUCTURE 9

IntroductiontoSmartMeters,AdvancedMeteringinfrastructure(AMI)driversandbenefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU),IntelligentElectronicDevices(IED)&theirapplicationformonitoring&protection.

UNITIV POWERQUALITYMANAGEMENT INSMARTGRID 9

PowerQuality&EMCinSmartGrid,PowerQualityissuesofGridconnectedRenewable Energy Sources,PowerQualityConditioners forSmartGrid,Web based Power Qualitymonitoring, PowerQualityAudit.

UNITV HIGHPERFORMANCE COMPUTINGFORSMART GRID APPLICATIONS 9

LocalArea Network(LAN),House Area Network(HAN), Wide Area Network(WAN), Broadband over Power line(BPL),IP based Protocols, Basics of Web Service and CLOUD Computingto make Smart Gridssmarter,CyberSecurityforSmartGrid.

TOTAL: 45 PERIODS

OUTCOMES:

- Learnerswilldevelop moreunderstandingon theconceptsofSmartGrid and itspresent developments.
- LearnerswillstudyaboutdifferentSmartGridtechnologies.
- Learnerswillacquireknowledgeaboutdifferentsmartmetersandadvanced meteringinfrastructure.
- Learnerswillhaveknowledgeon powerquality managementin SmartGrids
- Learnerswilldevelop moreunderstandingon LAN,WANandCloud Computingfor SmartGrid applications.

TEXTBOOKS:

1. StuartBorlase"SmartGrid: Infrastructure,TechnologyandSolutions",CRCPress2012.
2. JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama, "SmartGrid:TechnologyandApplications",Wiley2012.

REFERENCES

- VehbiC.Güngör,DilanSahin,TaskinKocak, Salih Ergüt,ConcettinaBuccella, CarloCecati, and Gerhard P. Hancke, "Smart GridTechnologies: CommunicationTechnologiesand Standards"IEEETransactionsOn IndustrialInformatics,Vol.7,No.4, November2011.
- XiFang, SatyajayantMisra,GuoliangXue,andDejunYang "SmartGrid –TheNewand Improved PowerGrid:ASurvey",IEEE Transaction on SmartGrids,vol.14,2012.
- JamesMomohe"Smart Grid: Fundamentals of DesignandAnalysis,",Wiley-IEEE Press, 2012.

17153E82F BIOMEDICALINSTRUMENTATION LTPC
30 0 3

OBJECTIVES:

- ToIntroduceFundamentals ofBiomedicalEngineering
- Tostudythecommunicationmechanicsin abiomedical systemwithfew examples
- Tostudymeasurementofcertain importantelectricalandnon-electrical parameters

- Tounderstand thebasicprinciplesinimagingtechniques
- Tohaveabasic knowledgeinlifeassistingand therapeuticdevices

UNITI FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure –Resting and Action Potential – Nervous systemand itsfundamentals -Basic componentsofabiomedicalsystem-Cardiovascularsystems-Respiratorysystems-Kidneyandbloodflow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements-Fibreoptictemperaturesensors

UNITII NON ELECTRICALPARAMETERS MEASUREMENTAND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - Pulmonary function measurements – spirometer – Photo Plethysmography, BodyPlethysmography– Blood Gasanalysers, pHofblood–measurementofbloodpCO2,pO2,finger-tipoxymeter-ESR,GSRmeasurements.

UNITIII ELECTRICALPARAMETERSACQUISITIONANDANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposability electrodes - Micro,needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopperamplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recordingmethods–Typical waveforms-Electricalsafetyinmedicalenvironment,shockhazards–leakagecurrent-Instrumentsfor checkingsafetyparametersofbiomedicalequipment.

UNITIV IMAGINGMODALITIESANDANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems - Retinal Imaging - Imaging application in Biometricsystems.

UNITV LIFEASSISTING,THERAPEUTICAND ROBOTIC DEVICES 9

Pacemakers–Defibrillators–Ventilators–Nerveandmusclestimulators–Diathermy–Heart–Lung machine–Audiometers–Dialysers–Lithotripsy-ICCUpatientmonitoringsystem-NanoRobots-Roboticsurgery–Orthopedicprosthesesfixation.

TOTAL: 45 PERIODS

OUTCOMES:Attheendofthecoursestudentswillhave the

- Abilityto understandthephilosophyof theheart,lung, blood circulation and respiration system.
- Abilitytoprovidelatest ideason devicesofnon-electricaldevices.
- Abilityto gain knowledgeon varioussensingandmeasurementdevicesofelectricalorigin.
- Abilitytounderstand theanalysis systemsofvariousorgan types.
- Abilitytobringout theimportantandmodernmethodsofimagingtechniquesandtheir analysis.
- Abilitytoexplain themedicalassistance/techniques, roboticandtherapeuticequipments.

TEXTBOOKS:

1. LeslieCromwell,“BiomedicalInstrumentationand Measurement”, PrenticeHallofIndia,New Delhi,2007.
2. KhandpurR.S,Handbook ofBiomedicalInstrumentation,TataMcGraw-Hill,NewDelhi,2nd edition,2003
3. JosephJCarrandJohnM.Brown,Introduction toBiomedicalEquipmentTechnology, John

Wileyandsons,NewYork,4th edition,2012

REFERENCES

1. John G.Webster,MedicalInstrumentation ApplicationandDesign,JohnWiley andsons, New York, 1998.
2. DuaneKnudson, FundamentalsofBiomechanics,Springer, 2nd Edition, 2007.
3. Suh,Sang,Gurupur, VaradrajP.,Tanik, MuratM.,Health CareSystems,Technologyand Techniques,Springer, 1stEdition, 2011.
4. Ed. Joseph D. Bronzino,TheBiomedicalEngineeringHandBook, ThirdEdition,Boca Raton, CRCPress LLC, 2006.
5. M.Arumugam, 'Bio-MedicalInstrumentation',Anuradha Agencies, 2003.

17153E82G	FUNDAMENTALS OFNANOSCIENCE	LTPC
		30 0 3

OBJECTIVES:

Tolearn aboutbasisofnanomaterialscience, preparation method, typesand application

UNITI INTRODUCTION 8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayeredmaterials.LengthScalesinvolvedandeffectonproperties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitativeonly).

UNITII GENERALMETHODSOF PREPARATION 9

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

UNITIII NANOMATERIALS 12

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes(SWCNT)andMultiwallcarbonnanotubes(MWCNT)-methodsofsynthesis(arc-growth,laser ablation,CVDroutes,PlasmaCVD),structure-propertyRelationshipsapplications-Nanometaloxides-ZnO, TiO_2,MgO, ZrO_2, NiO, nanoalumina, CaO, $AgTiO_2$, Ferrites, Nanoclays-functionalization and applications-Quantum wires, Quantum dots-preparation, properties and applications.

UNITIV CHARACTERIZATION TECHNIQUES 9

X-raydiffractiontechnique,ScanningElectronMicroscopy-environmentaltechniques,TransmissionElectron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM,STM,SNOM, ESCA,SIMS-Nanoindentation.

UNITV APPLICATIONS 7

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetteddrug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro MechanicalSystems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition, Nanoparticles forsunbarrier products-InPhotostat, printing,solarcell, battery.

TOTAL:45 PERIODS

OUTCOMES:

- Willfamiliarizeaboutthe scienceofnanomaterials
- Willdemonstratethepreparation ofnanomaterials
- Willdevelop knowledgeincharacteristicnanomaterial

TEXTBOOKS :

1.A.S. Edelstein andR.C.Cammearata,eds., “Nanomaterials:Synthesis, Propertiesand Applications”, InstituteofPhysicsPublishing,BristolandPhiladelphia,1996.
2.NJohn Dinardo, “Nanoscale Charecterisation ofsurfaces&Interfaces”, 2nd edition, WeinheimCambridge,Wiley-VCH,2000.

REFERENCES:

1.GTimp, “Nanotechnology”,AIPpress/Springer, 1999.
2.AkhleshLakhtakia,“The HandBook of NanoTechnology,NanometerStructure, Theory,Modeling andSimulations”.Prentice-HallofIndia(P)Ltd, NewDelhi,2007.

17153E76E- POWER SYSTEM TRANSIENTS

1. 3 0 0 3

Semester VII

AIM

To understand generation of switching and lighting transients, their propagation, reflection and refraction a on the grid ad their impact on the grid equipment.

OBJECTIVES

i. To study the generation of switching transients and their control using circuit – theoretical concept.
ii. To study the mechanism of lighting strokes and the production of lighting surges.
iii. To study the propagation, reflection and refraction of travelling waves.
iv. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

UNIT I INTRODUCTION AND SURVEY 7

Various types of power system transients - effects of transients on power systems.

UNIT IILIGHTNING AND SWITCHING SURGES 17

Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNIT III MODELLING OF POWER SYSTEM EQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNIT IV COMPUTATION OF TRANSIENT OVERVOLTAGES 14 Computation of transients – traveling wave method, Bewley’s lattice diagram – analysis in time and frequency domain, EMTP for transient computation.

UNIT V INSULATION COORDINATION 12

Insulation co-ordination – over voltage protective devises principles of recent co-ordination and design of EHV lines.

Total = 60

1. TEXT BOOKS

2. 1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter science, New York, 2nd edition 1991***.***
2. R.D Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.

REFERENCES

1. Klaus Ragaller, 'Surges in High Voltage Networks', Plenum Press, New York, 1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

PRIST DEEMED UNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAMME: M.TECH-POWER SYSTEMS (FULL TIME)

CURRICULUM -REGULATION 2017

SEMESTER – I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11D	Applied Mathematics For Electrical &Electronics Engineering	3	1	0	4
2	17272H12	System Theory	3	1	0	4
3	17272H13	Power System Modeling and Analysis	3	1	0	4
4	17272H14	Economic Operations of Power Systems-I	3	1	0	4
5	17272H15	High Voltage Direct Current Transmission System	3	1	0	4
6	17272E16_	Elective-I	3	1	0	4
7	17272L17	Power System Simulation Lab-I	0	0	3	3
8	17272CRS	Research Led Seminar				1
		TOTAL				28

SEMESTER – II

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21	EHV power transmission	3	1	0	4
2	17272H22	Economic Operations of Power Systems-II	3	1	0	4
3	17272H23	Power System Protection	3	1	0	4
4	17272E24_	Elective –II	3	1	0	4
5	17272E25_	Elective –III	3	1	0	4
6	17272L26	Power System Simulation Lab-II	0	0	3	3
7	172TECWR	Technical Writing/Seminars	0	0	3	3
8	17272CRM	Research Methodology				3
9	17272CBR	Participation in Bounded Research				2
		TOTAL				31

SEMESTER – III

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31	Electrical Transients in power systems	3	1	0	4
2	17272E32_	Elective –IV	3	1	0	4
3	17272E33_	Elective –V	3	1	0	4
4	17272E34_	Elective –VI	3	1	0	4
5	17272P35	Project work Phase-I	0	0	6	6
6	17272CSR	Design Project / Socio Technical Project (Scaffolded Research)				4
		TOTAL				26

SEMESTER – IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272P44	Project work Phase-II	0	0	12	12

Total Credits = 97

Elective –I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E16A	Analysis of Inverters	3	1	0	4
2.	17272E16B	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective –II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E24A	Flexible AC Transmission system	3	1	0	4
2.	17272E24B	Power System Planning and Reliability	3	1	0	4

Elective –III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E25A	Wind Energy conversion systems	3	1	0	4
2.	17272E25B	AI Techniques to Power Systems	3	1	0	4

Elective –IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E32A	Power Electronics applications in Power systems	3	1	0	4
2.	17272E32B	Power system Dynamics	3	1	0	4

Elective –V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33A	Power Conditioning	3	1	0	4
2.	17272E33B	Power system restructuring and deregulation	3	1	0	4

Elective –VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E34A	Software for Control system Design	3	1	0	4
2.	17272E34B	Industrial Power system analysis and design	3	1	0	4

SYLLABUS

SEMESTER I

17248S11D - APPLIED MATHEMATICS FOR ELECTRICAL &ELECTRONICS ENGINEERING 3 1 0 4

1. ADVANCED MATRIX THEORY 9

Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.

2. RANDOM PROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .

3. LINEAR PROGRAMMING 9

Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.

4. DYNAMIC PROGRAMMING 9

Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS 9

Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of Jn(p) = 0, Transform of

$$\frac{d2f}{dx2} + \frac{1}{x}\frac{df}{dx}, \text{ and Transform of } \frac{d2f}{dx2} + \frac{1}{x}\frac{df}{dx} - \frac{n2f}{x2}$$

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).

5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

SEMESTER – I

17272H12 - SYSTEM THEORY

3 1 0 4

1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT **9**

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS **9**

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS **9**

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS **9**

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY **9**

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. M. Gopal, 'Modern Control Engineering', Wiley, 1996.
2. J.S. Bay, 'Linear State Space Systems', McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, 'System dynamics & Control', Thomson Brooks / Cole, 1998.
4. K. Ogatta, 'Modern Control Engineering', Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, 'Automatic control systems', Jaico publishers, 1993.
6. John S. Bay, 'Linear State Space Systems', McGraw-Hill International Edition, 1999.

SEMESTER – I

17272H13 - POWER SYSTEM MODELLING AND ANALYSIS

3 1 0 4

1. SOLUTION TECHNIQUE **9**

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS **9**

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW **9**

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS **9**

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS **9**

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. G W Stagg, A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol: AC-18, pp: 333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization: Basic Computational Algorithm and Programming Techniques; pp: 75-96; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd,Academic Press, 1971.

SEMESTER - I

17272H14 - ECONOMIC OPERATIONS OF POWER SYSTEMS-I

3 1 0 4

1. INTRODUCTION 9

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM 9

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal sitting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT 9

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, "Economic control of Interconnected systems", Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

SEMESTER – I

17272H15- HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM

3 1 0 4

1. DC POWER TRANSMISSION TECHNOLOGY 9

Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.

2. ANALYSIS OF HVDC CONVERTERS 9

Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.

3. CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.

4. HARMONICS AND FILTERS 9

Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.

5. SIMULATION OF HVDC SYSTEMS 9

Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

SEMESTER – I

17272L17- POWER SYSTEM SIMULATION LABORATORY – I 0 0 3 3

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

SEMESTER –II

17272H21 - EHV POWER TRANSMISSION

3 1 0 4

1. INTRODUCTION 9

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS 9

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

SEMESTER – II

17272H22 - ECONOMIC OPERATIONS OF POWER SYSTEMS-II

3 1 0 4

1. AUTOMATIC GENERATION CONTROL 9

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL 9

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT 9

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION 9

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system- computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM 9

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kundur.P., "power system stability and control", McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A, "power system control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "power systems voltage stability", McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, "voltage stability of power system", Kluwer Acadamic Publishers, 1998.

7. Elgerd O.L., "Elctric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

SEMESTER – II

17272H23 - POWER SYSTEM PROTECTION

3 1 0 4

1. INTRODUCTION 9

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION 9

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION 9

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING 9

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING 9

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Arun k. Phadke, James.S.Thorp, " Computer relaying for power system", John Wiley and sons, New York, 1988.
2. Jones D., "Analysis and protection of electrical power systems", Pitman Publishing, 1971.
3. "Power system references manual, Ray rolls protection", Orient press, 1982.
4. Stanly H., Horowitz (ED), "Protective relaying for power system", IEEE press, 1980.
5. Kundur P., "power system stability and control", McGraw Hill, 1994.

SEMESTER - II

17272L26- POWER SYSTEM SIMULATION LAB – II 0 0 3 3

LIST OF EXPRIMENTS:

1. Small signal stability analysis: SMIB and Multi machine configuration.
2. Transients stability analysis of Multi – machine configuration.
3. Load Frequency control: single area, multi area control.
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

SEMESTER – III

17272H31 - ELECTRICAL TRANSIENTS IN POWER SYSTEMS

3 1 0 4

1. TRAVELLING WAVES ON TRANSMISSION LINE 9

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas

Insulated System', CIGRE, 33-13, pp. 1-2

ELECTIVE- I (semester-I)

17272E16A - ANALYSIS OF INVERTERS

3 1 0 4

UNIT- I- SINGLE PHASE INVERTERS 9

Introduction to self commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT-II- THREE PHASE VOLTAGE SOURCE INVERTERS 9

180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT-III- CURRENT SOURCE INVERTERS 9

Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters

UNIT-IV- MULTILEVEL INVERTERS 9

Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT-V- RESONANT INVERTERS 9

Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

L=45 T=15 P=0 C=4

TEXT BOOKS

1. Rashid M.H., "Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.
2. Jai P.Agrawal, "Power Electronics Systems", Pearson Education, Second Edition, 2002.
3. Bimal K.Bose "Modern Power Electronics and AC Drives", Pearson Education, Second Edition, 2003.

4. Ned Mohan,Undeland and Robbin, "Power Electronics: converters, Application and design" John Wiley and sons.Inc,Newyork,1995.
5. Philip T. krein, "Elements of Power Electronics" Oxford University Press -1998.

REFERENCES

1. P.C. Sen, "Modern Power Electronics", Wheeler Publishing Co, First Edition, New Delhi, 1998.
2. P.S.Bimbra, "Power Electronics", Khanna Publishers, Eleventh Edition, 2003.

ELECTIVE– I (semester-I)

17272E16B - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3 1 0 4

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION
General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.
.

UNIT II BASIC CONCEPTS OF ROTATING MACHINES
Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY
Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron's primitive machine.

UNIT IVD ETERMINATIONOF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS
Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES
Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

L = 45 T = 15 P = 0 C =4

TEXT BOOKS
1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, 'Electric Machinery', Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.

REFERENCES
1. C.V. Jones, 'The Unified Theory of Electrical Machines', Butterworth, 1967.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives' Clarendon Press, 1989.

ELECTIVES – II (semester-II)

17272E24A - FLEXIBLE AC TRANSMISSION SYSTEM

3 1 0 4

1. INTRODUCTION 9

FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.

2. SERIES COMPENSATION SCHEMES 9

Sub-Synchronous resonance, Torsional interaction, torsional torque, Compensation of conventional, ASC, NGH damping schemes, Modelling and control of thyristor controlled series compensators.

3. UNIFIED POWER FLOW CONTROL 9

Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.

4. DESIGN OF FACTS CONTROLLERS 9

Approximate multi-model decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, variable structure resistor control.

5. STATIC VAR COMPENSATION 9

Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor(TSR), Thyristor switched capacitor(TSC), saturated reactor (SR) , and fixed capacitor (FC)

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40-45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems ", IEEE Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.
4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
5. Gyugyi L., " Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

ELECTIVES – II (semester-II)

17272E24B - POWER SYSTEM PLANNING AND RELIABILITY

3 1 0 4

1. LOAD FORECASTING 9

Objectives of forecasting - Load growth patterns and their importance in planning – Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

2. GENERATION SYSTEM RELIABILITY ANALYSIS 9

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of iso and interconnected generation systems.

3. TRANSMISSION SYSTEM RELIABILITY ANALYSIS 9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

4. EXPANSION PLANNING 9

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

5. DISTRIBUTION SYSTEM PLANNING OVERVIEW 9

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Proceeding of work shop on energy systems planning & manufacturing CI.
2. R.L .Sullivan, “ Power System Planning”,.
3. Roy Billinton and Allan Ronald, “Power System Reliability.”
4. Turan Gonen, Electric power distribution system Engineering ‘McGraw Hill,1986

ELECTIVES – III (semester-II)

17272E25A - WIND ENERGY CONVERSION SYSTEMS

3 1 0 4

UNIT-I INTRODUCTION: **9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECVTRIC POWER GENERATION: **9**

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS: **9**

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments-anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND CONTROL ASPECTS: **9**

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanenet magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY **9**

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, “Pirnam’s and Power from the wind”, Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, “Wind Energy System”, Prentice hall Inc., Englewood Cliffs, New

Jersey, 1985.

4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

ELECTIVE III ***(semester-II)***

17272E25B - AI TECHNIQUES TO POWER SYSTEMS

3 1 0 4

1. INTRODUCTION TO NEURAL NETWORKS 9

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS 9

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC 9

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS 9

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS 9

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques‟, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information‟, Prentice Hall of India, 1993.
3. Zimmerman.H.J„„Fuzzy Set Theory and its Applications‟, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems‟, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering‟, John Wiley &

SonsLtd.,1998.

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ELECTIVES – IV (semester-III)

17272E32A - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS

3 1 0 4

UNIT: I STATIC COMPENSATOR CONTROL 9

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) -Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT 9

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL 9

Solid state excitation of synchronous generators - Different schemes - Generex excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM 9

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C =4

TEXT BOOK

Miller. T.J.E, “Reactive power control in Electric systems”. Wiley inter science, New York, 1982.

REFRENCES

1. “Static Compensator for AC power systems”, Proc. IEE vol.128 Nov. 1981. pp 362-406.
2 “A Static alternative to the transformer on load tap changing”, IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. “Improvements in Thyristor controlled static on- load tap controllers

for transformers", IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. "Shunt Thyristor rectifiers for the Generex Excitation systems", IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

ELECTIVES – IV (semester-III)

17272E32B- POWER SYSTEM DYNAMICS

3 1 0 4

1. SYNCHRONOUS MACHINE MODELLING 9

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad}-reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System;Control and protective functions;IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical

Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, “Power System Stability and Control”, McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies”, IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, “Power System Control and Stability”, Iowa State University Press, Ames, Iowa, 1978.

ELECTIVES – V (semester-III)

17272E33A - POWER CONDITIONING

3 1 0 4

1. INTRODUCTION 9

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS 9

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS 9

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS 9

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On–line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT 9

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T, “Electric Power Quality”, Stars in a Circle Publications, 1994(2nd edition)
3. Dugan.R.C, “ Electrical Power System Quality”,TMH,2008.
4.Arrillga.A.J and Neville R.Watson, Power System Harmonics, John Wiley second Edition,2003.
5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.

ELECTIVES – V (semester-III)

17272E33B – POWER SYSTEM RESTRUCTURING AND DEREGULATION

3 1 0 4

1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, 2001
2. Loi Lei Lai, "Power system Restructuring and Regulation", John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, "Restructuring Electrical Power Systems", Marcel Decker Inc., 2001.
4. Steven Stoft, " Power System Economics", Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, " Fundamentals of Power System Economics", John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

ELECTIVES – VI (semester-III)

17272E34A - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion-– Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.-simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,”Modern Control Engineering”,PHI,1997.
5. Dorf and Bishop,”Modern control Engineering’, Addison Wesley, 1998.

ELECTIVES – VI (semester-III)

17272E34B - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS 9

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, "Computer-Aided Power System Analysis", Marcel Dekker Inc., 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student's knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research
Level 2: Bounded Research
Level 3: Scaffolded Research
Level 4: Self actuated Research
Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment: 40 Marks**

- Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
- Seminar Review Presentation : 10 Marks
- Literature Survey : 10 Marks

- **Semester Examination : 60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews: 40 Marks**
  - Review I : 10 Marks
  - Review II : 10 Marks
  - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report: 40 Marks**
- **Viva- Voce Examination: 20 Marks**
- **Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment: 20 Marks

- Research Tools(Lab) : 10 Marks
- Tutorial: 10 Marks

Model Paper Writing: 40 Marks

- Abstract: 5 Marks
- Introduction: 10 Marks
- Discussion: 10 Marks
- Review of Literature: 5 Marks
- Presentation: 10 Marks

Semester Examination: 40 Marks

Total: 100 Marks

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CURRICULUM -REGULATION 2017

SEMESTER – I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17248S11DP	Applied Mathematics For Electrical &Electronics Engineering	3	1	0	4
2.	17272H12P	System Theory	3	1	0	4
3.	17272H13P	Power System Modeling and Analysis	3	1	0	4
4.	17272L14P	Power System Simulation Lab-I	0	0	3	3
5.	17272CRSP	Research Led Seminar				1
		TOTAL				16

SEMESTER – II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H21P	EHV power transmission.	3	1	0	4
2	17272H22P	Power System Protection	3	1	0	4
3	17272E23_P	Elective-I	3	1	0	4
4	172TECWRP	Technical Writing/Seminars	0	0	3	3
5	17272CRMP	Research Methodology				3
6	17272CBRP	Participation in Bounded Research				2
		TOTAL				20

SEMESTER – III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H31P	Economic Operations of Power Systems-I	3	1	0	4
2	17272H32P	High Voltage Direct Current Transmission	3	1	0	4

		System				
3	17272E33_P	Elective -II	3	1	0	4
4	17272L34P	Power System Simulation Lab-II	0	0	3	3
5	17272CSRP	Design Project / Socio Technical Project (Scaffolded Research)				4
		TOTAL				19

SEMESTER – IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272H41P	Economic Operations Of Power Systems-II	3	1	0	4
2	17272H42P	Electrical Transients in power systems	3	1	0	4
3	17272E43_P	Elective -III	3	1	0	4
4	17272P44P	Project work Phase -I	0	0	6	6
		TOTAL				18

SEMESTER – V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272E51_P	Elective –IV	3	1	0	4
2.	17272E52_P	Elective –V	3	1	0	4
3.	17272E53_P	Elective –VI	3	1	0	4
		TOTAL				12

SEMESTER – VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	17272P61P	Project work Phase -II	0	0	12	12

Total Credits = 87

Elective –I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E23AP	Flexible AC Transmission System	3	1	0	4
2.	17272E23BP	Power System Planning and Reliability	3	1	0	4

Elective –II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E33AP	Analysis of Inverters	3	1	0	4
2.	17272E33BP	Modeling and Analysis of Electrical Machines	3	1	0	4

Elective –III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E43AP	Wind Energy conversion systems	3	1	0	4
2.	17272E43BP	AI Techniques to Power Systems	3	1	0	4

Elective –IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E51AP	Power Electronics applications in Power systems	3	1	0	4
2.	17272E51BP	Power system Dynamics	3	1	0	4

Elective –V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E52AP	Power Conditioning	3	1	0	4
2.	17272E52BP	Power system restructuring and deregulation	3	1	0	4

Elective –VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	17272E53AP	Software for Control system Design	3	1	0	4
2.	17272E53BP	Industrial Power system analysis and design	3	1	0	4

SYLLABUS

SEMESTER I

17248S11DP -APPLIED MATHEMATICS FOR ELECTRICAL & LECTRONICS ENGINEERING

3 1 0 4

1. ADVANCED MATRIX THEORY 9

Matrix norms – Jordan canonical form – Generalized eigenvectors – Singular value decomposition – Pseudo inverse – Least square approximations.

2. RANDOM PROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson, normal and exponential distributions density & distribution Functions- Moments Moment Generating Functions – Notion of stochastic processes - Auto-correlation – Cross correlation .

3. LINEAR PROGRAMMING 9

Basic concepts – Graphical and Simplex methods –Transportation problem – Assignment problem.

4. DYNAMIC PROGRAMMING 9

Elements of the dynamic programming model – optimality principle – Examples of dynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS 9

Finite Fourier transform - Fourier series - Finite sine Transform - Cosine transform - finite Hankel transform - definition, Transform of df/dx where p is a root of Jn(p) = 0, Transform of

$\frac{d2f}{dx2} + \frac{1}{x}\frac{df}{dx}$, and Transform of $\frac{d2f}{dx2} + \frac{1}{x}\frac{df}{dx} - \frac{n2f}{x2}$

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Lewis.D.W., Matrix Theory ,Allied Publishers, Chennai 1995.
2. Bronson, R, Matrix Operations, Schaums outline Series, McGraw Hill, New York. 1989.
3. Andrews, L.A., and Shivamoggi B.K., “Integral Transforms for Engineers and Applied Mathematicians”, Macmillan , New York ,1988.

4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).
5. Gupta, P.K.and Hira, D.S., " Operations Research ", S.Chand & Co., New Delhi, (1999).6..
6. Ochi, M.K. " Applied Probability and Stochastic Processes ", John Wiley & Sons (1992).
7. Peebles Jr., P.Z., " Probability Random Variables and Random Signal Principles, McGraw Hill Inc., (1993).

SEMESTER – I

17272H12P - SYSTEM THEORY

3 1 0 4

1. PHYSICAL SYSTEMS AND STATE ASSIGNMENT **9**

Systems - electrical - mechanical - hydraulic - pneumatic - thermal systems - modelling of some typical systems like D.C. Machines - inverted pendulum.

2. STATE SPACE ANALYSIS **9**

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrix and its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMO SYSTEMS - FREQUENCY DOMAIN DESCRIPTIONS **9**

Properties of transfer functions - impulse response matrices - poles and zeros of transfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEAR SYSTEMS **9**

Types of non-linearity - typical examples - equivalent linearization - phase plane analysis - limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY **9**

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov’s method and its extensions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. M. Gopal, ‘Modern Control Engineering’, Wiley, 1996.
2. J.S. Bay, ‘Linear State Space Systems’, McGraw-Hill, 1999.
3. Eroni-Umez and Eroni, ‘System dynamics & Control’, Thomson Brooks / Cole, 1998.
4. K. Ogatta, ‘Modern Control Engineering’, Pearson Education, Low Priced Edition, 1997.
5. G.J. Thaler, ‘Automatic control systems’, Jaico publishers, 1993.
6. John S. Bay, ‘Linear State Space Systems’, McGraw-Hill International Edition, 1999.

SEMESTER – I

17272H13P - POWER SYSTEM MODELLING AND ANALYSIS

3 1 0 4

1. SOLUTION TECHNIQUE 9

Sparse Matrix techniques for large scale power systems: Optimal ordering schemes for preserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays – Factorization by Bifactorization and Gauss elimination methods; Repeat solution using Left and Right factors and L and U matrices.

2. POWER FLOW ANALYSIS 9

Power flow equation in real and polar forms; Review of Newton's method for solution; Adjustment of P-V buses; Review of Fast Decoupled Power Flow method; Sensitivity factors for P-V bus adjustment; Net Interchange power control in Multi-area power flow analysis: ATC, Assessment of Available Transfer Capability (ATC) using Repeated Power Flow method; Continuation Power Flow method.

3. OPTIMAL POWER FLOW 9

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With real power variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

4. SHORT CIRCUIT ANALYSIS 9

Fault calculations using sequence networks for different types of faults. Bus impedance matrix (ZBUS) construction using Building Algorithm for lines with mutual coupling; Simple numerical problems. Computer method for fault analysis using ZBUS and sequence components. Derivation of equations for bus voltages, fault current and line currents, both in sequence and phase domain using Thevenin's equivalent and ZBUS matrix for different faults.

5. TRANSIENT STABILITY ANALYSIS 9

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. G W Stagg , A.H El. Abiad "Computer Methods in Power System Analysis", McGraw Hill 1968.
2. P.Kundur, "Power System Stability and Control", McGraw Hill, 1994.
3. A.J.Wood and B.F.Wollenberg, "Power Generation Operation and Control", John Wiley and sons, New York, 1996.
4. W.F.Tinney and W.S.Meyer, "Solution of Large Sparse System by Ordered Triangular Factorization" IEEE Trans. on Automatic Control, Vol : AC-18, pp:333-346, Aug 1973.
5. K.Zollenkopf, "Bi-Factorization : Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on "Large Sparse Set of Linear Systems" Editor: J.K.Rerd,Academic Press, 1971.

SEMESTER – I

17272L14P- POWER SYSTEM SIMULATION LAB – I

0 0 3 3

EXPERIMENTS

1. Formation of Y bus, Z bus, line parameters and modeling of transmission lines.
2. Power flow analysis: Gauss – Seidel Method.
3. Power flow analysis: Newton Raphson method.
4. Plain Decoupled and Fast Decoupled methods.
5. Contingency analysis – single and multiple symmetrical and unsymmetrical faults.

P=3 C=3

SEMESTER -II

17272H21P - EHV POWER TRANSMISSION

3 1 0 4

1. INTRODUCTION 9

Standard transmission voltages – different configurations of EHV and UHV lines – average values of line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

2. CALCULATION OF LINE PARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modes of propagation – resistance and inductance of ground return, numerical example involving a typical 400/220kV line using line constant program.

3. VOLTAGE GRADIENTS OF CONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductors of bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONA EFFECTS 9

Power losses and audible losses: I R loss and corona loss - audible noise generation and characteristics - limits for audible noise - Day-Night equivalent noise level- radio interference: corona pulse generation and properties - limits for radio interference fields

5. ELECTROSTATIC FIELD OF EHV LINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 1990.
2. Power Engineer’s Handbook, Revised and Enlarged 6th Edition, TNEB Engineers’ Association, October 2002.
3. Microtran Power System Analysis Corporation, Microtran Reference Manual, Vancouver Canada. (Website: www.microtran.com).

SEMESTER – II

17272H22P - POWER SYSTEM PROTECTION

3 1 0 4

1. INTRODUCTION 9

General philosophy – Review of conventional equipment protection schemes – state of the art: Numerical relays

2. DISTANCE PROTECTION 9

Transmission line protection – fault clearing times – relaying quantities during swings – evaluation of distance relay performance during swings – prevention of tripping during transient conditions – automatic line reclosing – generator out of step protection – simulation of distance relays during transients.

3. GENERATOR PROTECTION 9

Out – of – step, loss of excitation. System response to severe upsets – nature of system response to severe upsets – frequency actuated schemes for load shedding and islanding.

4. INTRODUCTION TO COMPUTER RELAYING 9

Development of computer relaying – historical background – Expected benefits of computer relaying – computer relay architecture – A/D converter – Anti aliasing filters – substation computer hierarchy.

5. DIGITAL TRANSMISSION LINE RELAYING 9

Introduction – source of error – relaying as parameter estimation – beyond parameter estimation – symmetrical component distance relay – protection of series compensated lines. Digital protection of transformers, machines and buses.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Arun k. Phadke, James.S.Thorp, “ Computer relaying for power system”, John Wiley and sons, New York, 1988.
2. Jones D., “Analysis and protection of electrical power systems”, Pitman Publishing, 1971.
3. “Power system references manual, Ray rolls protection”, Orient press, 1982.
4. Stanly H., Horowitz (ED), “Protective relaying for power system”, IEEE press, 1980.
5. Kundur P., “power system stability and control”, McGraw Hill, 1994.

SEMESTER - III

17272H31P - ECONOMIC OPERATIONS OF POWER SYSTEMS-I

3 1 0 4

1. INTRODUCTION 9

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use of participation factors in on line economic dispatch.

2. OPTIMAL POWER FLOW PROBLEM 9

Real and reactive power control variables – operation and security constraints and their limits – general OPF problem with different objective functions – formulation – cost loss minimization using Dommel and Tinney's method and SLP – development of model and algorithm – MVAR planning – optimal sitting and sizing of capacitors using SLR method – interchange evaluation using SLP.

3. HYDRO THERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal system with pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNIT COMMITMENT 9

Constraints in unit commitment – solution by priority list method – dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCE SCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operation of power systems", John Wiley and sons Inc, New York, 1958.
3. Krichmayer L.K, "Economic control of Interconnected systems", Jhon Wiley and sons Inc, New York, 1959.
4. Elgerd O.I., "Electric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

SEMESTER – III

17272H32P- HIGH VOLTAGE DIRECT CURRENT TRANSMISSION SYSTEM

3 1 0 4

1. DC POWER TRANSMISSION TECHNOLOGY 9

Introduction – comparison of Ac and DC transmission _ application of DC transmission – description of DC transmission system system – planning for HVDC transmission – modern trends in DC transmission.

2. ANALYSIS OF HVDC CONVERTERS 9

Pulse number – choice of converter configuration simplified analysis of Graetz circuit converter converter bridge characteristics – characteristics of a twelve pulse converter – detailed analysis of converters.

3. CONVERTER AND HVDC SYSTEM CONTROL 9

General principles of DC link control – converter control characteristics – systems control hierarchy – firing angle control – current and extinction angle control – starting and stopping of DC link – power control – higher level controllers – telecommunication requirements.

4. HARMONICS AND FILTERS 9

Introduction – generation of harmonics – design of AC filters – DC filters – carrier frequency and RI noise.

5. SIMULATION OF HVDC SYSTEMS 9

Introduction – system simulation: Philosophy and tools- HVDC system simulation – modeling of HVDC systems for digital dynamic simulation.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Padiyar. K.R., HVDC power transmission system, Wiley Eastern Limited, New Delhi, 1990.
2. Edward Wilson Kimbark, Direct Current Transmission, Vol.1, Wiley Interscience, New York, London, Sydney, 1971.
3. Rakosh Das Begamudre, Extra high voltage AC transmission engineering Wiley Eastern Ltd., New Delhi, 1990.
4. Arrillaga, J, High voltage direct current transmission, peter Pregrinus, London, 1983.
5. Adamson.C and Hingorani.N.G., High Voltage Direct Current Power Transmission, Garraway Limited, London, 1960. WWW.hvdc.ca

SEMESTER - III

17272L34P- POWER SYSTEM SIMULATION LAB – II 0 0 3 3

LIST OF EXPRIMENTS:

1. Small signal stability analysis: SMIB and Multi machine configuration.
2. Transients stability analysis of Multi – machine configuration.
3. Load Frequency control: single area, multi area control.
4. Economic load dispatch with losses
5. Unit commitment by dynamic programming & priority list method

P=3 C=3

SEMESTER – IV

17272H41P - ECONOMIC OPERATIONS OF POWER SYSTEMS-II 3 1 0 4

1. AUTOMATIC GENERATION CONTROL 9

Plant and system level control problem – ALFC of single area system modeling state and transient response – EDC control loop – ALFC of multi area system – modeling – static and transient response of two area system development of state variable model – two area system – AGC system design Kalman's method.

2. AUTOMATIC VOLTAGE CONTROL 9

Modeling of AVR loop – components – dynamic and static analysis – stability compensation – system level voltage control using OLTC, capacitor and generator voltages – expert system application for system voltage control.

3. SECURITY CONTROL CONCEPT 9

System operating states by security control functions – monitoring evaluation of system state by contingency analysis – corrective controls (preventive, emergency and restorative) – islanding scheme.

4. STATE ESTIMATION 9

Least square estimation – basic solution – sequential form of solution – static state estimation of power system by different algorithms – tracking state estimation of power system- computation consideration – external equivalency. Treatment of bad data and on line load flow analysis.

5. COMPUTER CONTROL OF POWER SYSTEM 9

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system – software in EMS system. Expert system applications for power system operation.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kundur.P., "power system stability and control", McGraw Hill, 1994.
2. Anderson P.M., and Fouad A.A, "power system control and stability", Galgotia publication, New Delhi, 1981.
3. Taylor C.W., "power systems voltage stability", McGraw Hill, New Delhi, 1993.
4. IEEE recommended practice for excitation system models for power system stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., "power system stability", Vol.3., Synchronous machines, John Wiley and sons, 1956.
6. T.V Custem, C.Vournas, "voltage stability of power system", Kluwer Acadamic Publishers, 1998.
7. Elgerd O.L., "Elctric energy systems theory – an introduction", McGraw Hill, New Delhi, 1971.

SEMESTER – IV

17272H42P - ELECTRICAL TRANSIENTS IN POWER SYSTEMS

3 1 0 4

1. TRAVELLING WAVES ON TRANSMISSION LINE 9

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction, Behavior of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion – Multi-conductor system and Velocity wave.

2. COMPUTATION OF POWER SYSTEM TRANSIENTS 9

Principle of digital computation – Matrix method of solution, Modal analysis, Z transforms, Computation using EMTP – Simulation of switches and non-linear elements.

3. LIGHTNING, SWITCHING AND TEMPORARY OVERVOLTAGES 9

Lightning: Physical phenomena of lightning – Interaction between lightning and power system – Factors contributing to line design – Switching: Short line or kilometric fault – Energizing transients - closing and re-closing of lines - line dropping, load rejection - Voltage induced by fault – Very Fast Transient Overvoltage (VFTO)

4. BEHAVIOUR OF WINDING UNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Pritindra Chowdhari, “Electromagnetic transients in Power System”, John Wiley and Sons Inc., 1996.
2. Allan Greenwood, “Electrical Transients in Power System”, Wiley & Sons Inc. New York, 1991.
3. Klaus Ragaller, “Surges in High Voltage Networks”, Plenum Press, New York, 1980.
4. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. Naidu M S and Kamaraju V, “High Voltage Engineering”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004.
6. IEEE Guide for safety in AC substation grounding IEEE Standard 80-2000.
7. Working Group 33/13-09 (1988), ‘Very fast transient phenomena associated with Gas Insulated System’, CIGRE, 33-13, pp. 1-2

ELECTIVES – I (semester-II)

17272E23AP- FLEXIBLE AC TRANSMISSION SYSTEM

3 1 0 4

1. INTRODUCTION 9

FACTS-a toolkit, Basic concepts of Static VAR compensator, Resonance damper, Thyristor controlled series capacitor, Static condenser, Phase angle regulator, and other controllers.

2. SERIES COMPENSATION SCHEMES 9

Sub-Synchronous resonance, Torsional interaction, torsional torque, Compensation of conventional, ASC, NGH damping schemes, Modelling and control of thyristor controlled series compensators.

3. UNIFIED POWER FLOW CONTROL 9

Introduction, Implementation of power flow control using conventional thyristors, Unified power flow concept, Implementation of unified power flow controller.

4. DESIGN OF FACTS CONTROLLERS 9

Approximate multi-model decomposition, Variable structure FACTS controllers for Power system transient stability, Non-linear variable-structure control, variable structure series capacitor control, variable structure resistor control.

5. STATIC VAR COMPENSATION 9

Basic concepts, Thyristor controlled reactor (TCR), Thyristors switched reactor(TSR), Thyristor switched capacitor(TSC), saturated reactor (SR) , and fixed capacitor (FC)

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Narin G.Hingorani, " Flexible AC Transmission ", IEEE Spectrum, April 1993, pp 40-45.
2. Narin G. Hingorani, " High Power Electronics and Flexible AC Transmission Systems ", IEEE Power Engineering Review, 1998.
3. Narin G.Hingorani, " Power Electronics in Electric Utilities : Role of Power Electronics in future power systems ", Proc. of IEEE, Vol.76, no.4, April 1988.
4. Einar V.Larsen, Juan J. Sanchez-Gasca, Joe H.Chow, " Concepts for design of FACTS Controllers to damp power swings ", IEEE Trans On Power Systems, Vol.10, No.2, May 1995.
5. Gyugyi L., " Unified power flow control concept for flexible AC transmission ", IEEE Proc-C Vol.139, No.4, July 1992.

ELECTIVES – I (semester-II)

17272E23BP - POWER SYSTEM PLANNING AND RELIABILITY

3 1 0 4

1. LOAD FORECASTING 9

Objectives of forecasting - Load growth patterns and their importance in planning – Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

2. GENERATION SYSTEM RELIABILITY ANALYSIS 9

Probabilistic generation and load models- Determination of LOLP and expected value of demand not served –Determination of reliability of iso and interconnected generation systems.

3. TRANSMISSION SYSTEM RELIABILITY ANALYSIS 9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmission system reliability analysis-Determination of reliability indices like LOLP and expected value of demand not served.

4. EXPANSION PLANNING 9

Basic concepts on expansion planning-procedure followed for integrate transmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

5. DISTRIBUTION SYSTEM PLANNING OVERVIEW 9

Introduction, sub transmission lines and distribution substations-Design primary and secondary systems-distribution system protection and coordination of protective devices.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Proceeding of work shop on energy systems planning & manufacturing CI.
2. R.L .Sullivan, " Power System Planning",.
3. Roy Billinton and Allan Ronald, "Power System Reliability."
4. Turan Gonen, Electric power distribution system Engineering 'McGraw Hill,1986

ELECTIVE- II (semester-III)

17272E33AP- ANALYSIS OF INVERTERS

3 1 0 4

UNIT- I- SINGLE PHASE INVERTERS 9

Introduction to self commutated switches: MOSFET and IGBT - Principle of operation of half and full bridge inverters – Performance parameters – Voltage control of single phase inverters using various PWM techniques – various harmonic elimination techniques – forced commutated Thyristor inverters.

UNIT-II- THREE PHASE VOLTAGE SOURCE INVERTERS 9

180 degree and 120 degree conduction mode inverters with star and delta connected loads – voltage control of three phase inverters: single, multi pulse, sinusoidal, space vector modulation techniques.

UNIT-III- CURRENT SOURCE INVERTERS 9

Operation of six-step thyristor inverter – inverter operation modes – load – commutated inverters – Auto sequential current source inverter (ASCI) – current pulsations – comparison of current source inverter and voltage source inverters

UNIT-IV- MULTILEVEL INVERTERS 9

Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters - Comparison of multilevel inverters - application of multilevel inverters

UNIT-V- RESONANT INVERTERS 9

Series and parallel resonant inverters - voltage control of resonant inverters – Class E resonant inverter – resonant DC – link inverters.

L=45 T=15 P=0 C=4

TEXT BOOKS

1. Rashid M.H., “Power Electronics Circuits, Devices and Applications ", Prentice Hall India, Third Edition, New Delhi, 2004.
2. Jai P.Agrawal, “Power Electronics Systems”, Pearson Education, Second Edition, 2002.
3. Bimal K.Bose “Modern Power Electronics and AC Drives”, Pearson Education, Second Edition, 2003.
4. Ned Mohan,Undeland and Robbin, “Power Electronics: converters, Application and design” John Wiley and sons.Inc,Newyork,1995.
5. Philip T. krein, “Elements of Power Electronics” Oxford University Press -1998.

REFERENCES

1. P.C. Sen, “Modern Power Electronics”, Wheeler Publishing Co, First Edition, New Delhi, 1998.
2. P.S.Bimbra, “Power Electronics”, Khanna Publishers, Eleventh Edition, 2003.

ELECTIVE– II (semester-III)

17272E33BP - MODELLING AND ANALYSIS OF ELECTRICAL MACHINES

3 1 0 4

UNIT I PRINCIPLES OF ELECTROMAGNETIC ENERGY CONVERSION

General expression of stored magnetic energy - co-energy and force/torque - example using single and doubly excited system.

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UNIT II BASIC CONCEPTS OF ROTATING MACHINES

Calculation of air gap M.M.F. - per phase machine inductance using physical machine data - voltage and torque equation of D.C. machine - three phase symmetrical induction machine and salient pole synchronous machines in phase variable form.

UNIT III INTRODUCTION TO REFERENCE FRAME THEORY

Static and rotating reference frames - transformation relationships - examples using static symmetrical three phase R, R-L, R-L-M and R-L-C circuits - application of reference frame theory to three phase symmetrical induction and synchronous machines - dynamic direct and quadrature axis model in arbitrarily rotating reference frames - voltage and torque equations - derivation of steady state phasor relationship from dynamic model - generalized theory of rotating electrical machine and Kron’s primitive machine.

UNIT IVD ETERMINATIONOF SYNCHRONOUS MACHINE DYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamic modeling of two phase asymmetrical induction machine and single phase induction machine.

UNIT V SPECIAL MACHINES

Permanent magnet synchronous machine - surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction and operating principle - dynamic modeling and self controlled operation - analysis of switch reluctance motors.

L = 45 T = 15 P = 0 C =4

TEXT BOOKS

1. Charles Kingsley, A.E. Fitzgerald Jr. and Stephen D. Umans, ‘Electric Machinery’, Tata McGraw-Hill, Fifth Edition, 1992.
2. R. Krishnan, ‘Electric Motor & Drives: Modelling, Analysis and Control’, Prentice Hall of India, 2001.

REFERENCES

1. C.V. Jones, ‘The Unified Theory of Electrical Machines’, Butterworth, 1967.
2. T.J.E. Miller, ‘Brushless Permanent Magnet and Reluctance Motor Drives’ Clarendon Press, 1989.

ELECTIVES – III (semester-IV)

17272E43AP - WIND ENERGY CONVERSION SYSTEMS

3 1 0 4

UNIT-I INTRODUCTION: **9**

History of wind Electric generation - Darrieus wind - Horizontal and vertical axis-Wind turbine - other modern developments - Future possibilities.

UNIT-II WIND RESOURCE AND ITS POTENTIAL FOR ELECVTRIC POWER GENERATION: 9

Power Extracted By A Wind Driven Machine - Nature and occurrence of wind characteristics and power production - variation of mean wind speed with time.

UNIT-III WIND POWER SITES AND WIND MEASUREMENTS: **9**

Average wind speed and other factors affecting choice of the site - Effect of wind direction - Measurement of wind velocity - Personal estimation without instruments-anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND CONTROL ASPECTS: 9

Asynchronous systems - Ac Generators - Self excitation of Induction Generator - Single Phase operation of Induction Generator - Permanenet magnet Generators - Basic control aspects - fixed speed ratio control scheme - fixed vs variable speed operation of WECS.

UNIT-V GENERATION OF ELECTRICITY 9

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. N.G.Calvert, 'Wind Power Principles: Their Application on small scale', Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, “Pirnam’s and Power from the wind”, Van Nastran Reinhold Co., London, 1979.
3. Gary L. Johnson, “Wind Energy System”, Prentice hall Inc., Englewood Cliffs, New Jersey, 1985.
4. Wind energy conversion system by L. Lfreris, Prentice hall (U.K) Ltd., 1990.

ELECTIVE III ***(semester-IV)***

17272E43BP - AI TECHNIQUES TO POWER SYSTEMS

3 1 0 4

1. INTRODUCTION TO NEURAL NETWORKS **9**

Basics of ANN - perceptron - delta learning rule - back propagation algorithm - multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. APPLICATIONS TO POWER SYSTEM PROBLEMS **9**

Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. INTRODUCTION TO FUZZY LOGIC **9**

Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. APPLICATIONS TO POWER SYSTEMS **9**

Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. GENETIC ALGORITHM AND ITS APPLICATIONS TO POWER SYSTEMS **9**

Introduction - simple genetic algorithm - reproduction - crossover - mutation – advanced operators in genetic search - applications to voltage control and stability studies.

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications and Programming Techniques‟, Addison Wesley, 1990.
2. George Klir and Tina Folger.A, „Fuzzy sets, Uncertainty and Information‟, Prentice Hall of India, 1993.
3. Zimmerman.H.J„„Fuzzy Set Theory and its Applications‟, Kluwer Academic Publishers 1994.
4. IEEE tutorial on „Application of Neural Network to Power Systems‟, 1996.
5. Loi Lei Lai, „Intelligent System Applications in Power Engineering‟, John Wiley & SonsLtd.,1998.

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ELECTIVES – IV (semester-V)

17272E51AP - POWER ELECTRONICS APPLICATIONS IN POWER SYSTEMS

3 1 0 4

UNIT: I STATIC COMPENSATOR CONTROL 9

Theory of load compensation - voltage regulation and power factor correction - phase balance and PF correction of unsymmetrical loads - Property of static compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) -Saturable core reactor - Control Strategies.

UNIT: II HARMONIC CONTROL AND POWER FACTOR IMPROVEMENT 9

Input power factor for different types of converters - power factor improvement using Load and forced commutated converters.

UNIT: III VOLTAGE CONTROL USING STATIC TAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor, different schemes - comparison.

UNIT: IV STATIC EXCITATION CONTROL 9

Solid state excitation of synchronous generators - Different schemes - Generex excitation systems.

UNIT: V UNINTERRUPTABLE POWER SUPPLY SYSTEM 9

Parallel, Redundant and non- redundant UPS - Ups using resonant power converters - Switch mode power supplies.

L = 45 T = 15 P = 0 C =4

TEXT BOOK

Miller. T.J.E, “Reactive power control in Electric systems”. Wiley inter science, New York, 1982.

REFRENCES

1. “Static Compensator for AC power systems”, Proc. IEE vol.128 Nov. 1981. pp 362-406.
2 “A Static alternative to the transformer on load tap changing”, IEEE Trans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. “Improvements in Thyristor controlled static on- load tap controllers for transformers”, IEEE Trans. on PAS, Vol.PAS-101, Sept.1982, pp3091-3095.
4. “Shunt Thyristor rectifiers for the Generex Excitation systems”, IEEE Trans. On PAS. PAS -96, July/August, 1977, pp1219-1325.

ELECTIVES – IV (semester-V)

17272E51BP - POWER SYSTEM DYNAMICS 3 1 0 4

1. SYNCHRONOUS MACHINE MODELLING 9

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine: stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkage and voltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation, Per Unit Representations: L_{ad}-reciprocal per unit system and that from power-invariant form of Park's transformation; Equivalent Circuits for direct and quadrature axes, Steady-state Analysis: Voltage, current and flux-linkage relationships, Phasor representation, Rotor angle, Steady-state equivalent circuit, Computation of steady-state values, Equations of Motion: Swing Equation, calculation of inertia constant, Representation in system studies, Synchronous Machine Representation in Stability Studies: Simplifications for large-scale studies : Neglect of stator $p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLING OF EXCITATION AND SPEED GOVERNING SYSTEMS 9

Excitation System Requirements; Elements of an Excitation System; Types of Excitation System;Control and protective functions;IEEE (1992) block diagram for simulation of excitation systems. Turbine and Governing System Modelling: Functional Block Diagram of Power Generation and Control, Schematic of a hydroelectric plant, classical transfer function of a hydraulic turbine (no derivation), special characteristic of hydraulic turbine, electrical analogue of hydraulic turbine, Governor for Hydraulic Turbine: Requirement for a transient droop, Block diagram of governor with transient droop compensation, Steam turbine modelling: Single reheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNAL STABILITY ANALYSIS WITHOUT CONTROLLERS 9

Classification of Stability, Basic Concepts and Definitions: Rotor angle stability, The Stability Phenomena. Fundamental Concepts of Stability of Dynamic Systems: State-space representation, stability of dynamic system, Linearisation, Eigen properties of the state matrix: Eigen values and eigenvectors, modal matrices, eigen value and stability, mode shape and participation factor. Single-Machine Infinite Bus (SMIB) Configuration: Classical Machine Model stability analysis with numerical example, Effects of Field Circuit Dynamics: synchronous machine, network and linearised system equations, block diagram representation with K-constants; expression for K-constants (no derivation), effect of field flux variation on system stability: analysis with numerical example,

4. SMALL-SIGNAL STABILITY ANALYSIS WITH CONTROLLERS 9

Effects Of Excitation System: Equations with definitions of appropriate K-constants and simple thyristor excitation system and AVR, block diagram with the excitation system, analysis of effect of AVR on synchronizing and damping components using a numerical example, Power System Stabiliser: Block diagram with AVR and PSS, Illustration of principle of PSS application with numerical example, Block diagram of PSS with description, system state matrix including PSS, analysis of stability with numerical a example. Multi-Machine Configuration: Equations in a common reference frame, equations in individual machine rotor coordinates, illustration of formation of system state matrix for a two-machine system with classical models for synchronous machines, illustration of stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENT OF SMALL SIGNAL STABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-based stabilizers – Digital Stabilizer – Excitation control design – Exciter gain – Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45 T = 15 P = 0 C =4

REFERENCES

1. P. Kundur, "Power System Stability and Control", McGraw-Hill, 1993.
2. IEEE Committee Report, "Dynamic Models for Steam and Hydro Turbines in Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.M Anderson and A.A Fouad, "Power System Control and Stability", Iowa State University Press, Ames, Iowa, 1978.

ELECTIVES – V (semester-V)

17272E52AP - POWER CONDITIONING

3 1 0 4

1. INTRODUCTION 9

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEAR LOADS 9

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENT AND ANALYSIS METHODS 9

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace's, Fourier and Hartley transform – The Walsh Transform – Wavelet Transform.

4. ANALYSIS AND CONVENTIONAL MITIGATION METHODS 9

Analysis of power outages, Analysis of unbalance: Symmetrical components of phasor quantities, Instantaneous symmetrical components, Instantaneous real and reactive powers, Analysis of distortion: On–line extraction of fundamental sequence components from measured samples – Harmonic indices – Analysis of voltage sag: Detorit Edison sag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWER QUALITY IMPROVEMENT 9

Utility-Customer interface –Harmonic filters: passive, Active and hybrid filters – Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protecting sensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L = 45 T = 15 P = 0 C =4

REFERENCES:

1. Arindam Ghosh "Power Quality Enhancement Using Custom Power Devices", Kluwer Academic Publishers, 2002.
2. Heydt.G.T, "Electric Power Quality", Stars in a Circle Publications, 1994(2nd edition)

3. Dugan.R.C, “ Electrical Power System Quality”,TMH,2008.
4.Arrillga.A.J and Neville R.Watson, Power System Harmonics, John Wiley second Edition,2003.
5. Derek A. Paice, “Power electronic converter harmonics”,John Wiley & sons, 1999.

ELECTIVES – V (semester-V)

17272E52BP – POWER SYSTEM RESTRUCTURING AND DEREGULATION

3 1 0 4

1. FUNDAMENTALS AND ARCHITECTURE OF POWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICAL CHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management – Bid, Zonal and Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSION NETWORKS AND SYSTEM SECURITY SERVICES 9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKET PRICING 9

Transmission pricing in open access system – Introduction – Spot Pricing – Uniform Pricing – Zonal Pricing – Locational Marginal Pricing – Congestion Pricing – Ramping and Opportunity Costs. Embedded cost based transmission pricing methods (Postage stamp, Contract path and MW-mile) – Incremental cost based transmission pricing methods (Short run marginal cost, Long run marginal cost) - Pricing of Losses on Lines and Nodes.

5. INDIAN POWER MARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled

Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Kankar Bhattacharya, Math H.J. Bollen and Jaap E. Daalder, "Operation of Restructured Power Systems", Kluwer Academic Publishers, 2001
2. Loi Lei Lai, "Power system Restructuring and Regulation", John Wiley sons, 2001.
3. Shahidehpour.M and Alomoush.M, "Restructuring Electrical Power Systems", Marcel Decker Inc., 2001.
4. Steven Stoft, " Power System Economics", Wiley – IEEE Press, 2002
5. Daniel S. Kirschen and Goran Strbac, " Fundamentals of Power System Economics", John Wiley & Sons Ltd., 2004.
6. Scholarly Transaction Papers and Utility web sites

ELECTIVES – VI (semester-V)

17272E53AP - SOFTWARE FOR CONTROL SYSTEM DESIGN

3 1 0 4

1. INTRODUCTION TO DESIGN AND CLASSICAL PID CONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon – Root Locus method – Open loop inversion-– Tuning using ISE, IAE and other performance indices.

2. COMPENSATOR DESIGN

Design of lag, lead, lead-lag compensators – Design using bode plots – Polar plots – Nichols charts – root locus and Routh Hurwitz criterion.

3. MATLAB

Introduction – function description – Data types – Tool boxes – Graphical Displays – Programs for solution of state equations – Controller design – Limitations.- simulink-Introduction – Graphical user interface – Starting – Selection of objects – Blocks – Lines - simulation – Application programs – Limitations.

4. MAPLE

Introduction – symbolic programming – Programming constructs – Data structure computation with formulae – Procedures – Numerical Programming.

5. MATLAB

Programs using MATLAB software

L = 45 T = 15 P = 0 C =4

REFERENCES

1. MAPLE V Programming guide.
2. MATLAB user manual.
3. SIMULINK user manual.
4. K.Ogatta ,"Modern Control Engineering",PHI,1997.
5. Dorf and Bishop,"Modern control Engineering', Addison Wesley, 1998.

ELECTIVES – VI (semester-V)

17272E53BP - INDUSTRIAL POWER SYSTEM ANALYSIS AND DESIGN

3 1 0 4

1. MOTOR STARTING STUDIES **9**

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWER FACTOR CORRECTION STUDIES **9**

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONIC ANALYSIS **9**

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKER ANALYSIS **9**

Sources of Flicker-Flicker Analysis-Flicker Criteria-Data for Flicker analysis- Case Study-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUND GRID ANALYSIS **9**

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45 T = 15 P = 0 C =4

REFERENCES

1. Ramasamy Natarajan, ”Computer-Aided Power System Analysis”, Marcel Dekker Inc., 2002.

Research Integrated Curriculum

The relationship between teacher and learner is completely different in higher education from what it is in school. At the higher level, the teacher is not there for the sake of the student, both have their justification in the service of scholarship. For the students who are the professionals of the future, developing the ability to investigate problems, make judgments on the basis of sound evidences, take decisions on a rational basis and understand what they are doing and why is vital. Research and inquiry is not just for those who choose to pursue an academic career. It is central to professional life in the twenty-first century.

It is observed that the modern world is characterized by heightened levels of complexity and uncertainty. Fluidity, fuzziness, instability, fragility, unpredictability, indeterminacy, turbulence, changeability, contestability: these are some of the terms that mark out the world of the twenty-first century. Teaching and research is correlated when they are co-related. Growing out of the research on teaching- research relations, the following framework has been developed and widely adopted to help individual staff, course teams and whole institutions analyse their curricula and consider ways of strengthening students understanding of and through research. Curricula can be:

Research – Led: Learning about current research in the discipline

Here the curriculum focus is to ensure that what students learn clearly reflects current and ongoing research in their discipline. This may include research done by staff teaching them.

Research – Oriented: Developing research skills and techniques

Here the focus is on developing student’s knowledge of and ability to carry out the research methodologies and methods appropriate to their discipline(s)

Research – Based: Undertaking research and inquiry

Here the curriculum focus is on ensuring that as much as possible the student learns in research and or inquiry mode (i.e. the students become producers of knowledge not just consumers). The strongest curricula form of this is in those special undergraduate programmes for selected students, but such research and inquiry may also be mainstreamed for all or many students.

Research- Tutored: engaging in research discussions

Here the focus is on students and staff critically discussing ongoing research in the discipline.

All four ways of engaging students with research and inquiry are valid and valuable and curricula can and should contain elements of them.

Moreover, the student participation in research may be classified as,

Level 1: Prescribed Research
Level 2: Bounded Research
Level 3: Scaffolded Research
Level 4: Self actuated Research
Level 5: Open Research

Taking into consideration the above mentioned facts in respect of integrating research into the M.Tech Power system curriculum, the following Research Skill Based Courses are introduced in the curriculum.

Semester	RSB Courses	Credits
I	Research Led Seminar	1
II	Research Methodology	3
II	Participation in Bounded Research	2
III	Design Project/ Socio Technical Project (Scaffolded Research)	4
IV	Project Work	12

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment: 40 Marks**
    - Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
    - Seminar Review Presentation : 10 Marks

- Literature Survey : 10 Marks

- **Semester Examination : 60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews: 40 Marks**
  - Review I : 10 Marks
  - Review II : 10 Marks
  - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report: 40 Marks**
- **Viva- Voce Examination: 20 Marks**
- **Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment: 20 Marks

- Research Tools(Lab) : 10 Marks
- Tutorial: 10 Marks

Model Paper Writing: 40 Marks

- Abstract: 5 Marks
- Introduction: 10 Marks
- Discussion: 10 Marks
- Review of Literature: 5 Marks
- Presentation: 10 Marks

Semester Examination: 40 Marks

Total: 100 Marks

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

B. Sc., MICROBIOLOGY
Academic year 2018-2019
2017 REGULATION
Mapping of courses to Cross cutting Issues

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Human Values	Ethics	Values	Sustainability	& Human Values
Microbiology & B. Sc.,	17116AEC13	Fundamentals of Microbiology					
Microbiology & B. Sc.,	17116AEC14L	Fundamentals of Microbiology Lab					
Microbiology & B. Sc.,	17115AEC15	Bio Chemistry I					
Microbiology & B. Sc.,	17115AEC16L	Bio Chemistry I Lab					
Microbiology & B. Sc.,	171__SEC01_	Skill Based Elective-I					
Microbiology & B. Sc.,	17111SEC01L	Communicative English Lab-I					
Microbiology & B. Sc.,	171INDCONS	Indian Constitution					

Microbiology of B. Sc.,	17116AEC23	Microbial Physiology					
Microbiology of B. Sc.,	17116AEC24L	Microbial Physiology Lab					
Microbiology of B. Sc.,	17115AEC25	BioChemistry II					
Microbiology of B. Sc.,	17115AEC26L	Bio Chemistry II Lab					
Microbiology of B. Sc.,	17116RLC27	Research LED Seminar					
Microbiology of B. Sc.,	171__SEC02__	Skill Based Elective – II					
Microbiology of B. Sc.,	17111SEC02L	Communicative English Lab-II					
Microbiology of B. Sc.,	17116AEC33	Soil and Agriculture Microbiology					
Microbiology of B. Sc.,	17116AEC34L	Soil and Agriculture Microbiology Lab					
Microbiology of B. Sc.,	17112AEC35	Biostatistics					
Microbiology of B. Sc.,	17112AEC36L	Biostatistics Lab					
Microbiology of B. Sc.,	17116RMC37	Research Methodology					
Microbiology of B. Sc.,	171__SEC03__	Skill based Elective-III					

Microbiology (B. Sc.)	17111SEC03L	Communicative English Lab-III						
Microbiology (B. Sc.)	17116AEC43	Virology						
Microbiology (B. Sc.)	17116AEC44L	Soil Microbiology and Virology Lab						
Microbiology (B. Sc.)	17116AEC45	Bioinformatics						
Microbiology (B. Sc.)	17116AEC46L	Bioinformatics Lab						
Microbiology (B. Sc.)	171__SEC04__	Skill based Elective-IV						
Microbiology (B. Sc.)	17111SEC04L	Communicative English Lab-IV						
Microbiology (B. Sc.)	171ENVTSTU	Environmental Studies						
Microbiology (B. Sc.)	17116AEC51	Food and Dairy Microbiology						
Microbiology (B. Sc.)	17116AEC52	Molecular Biology						
Microbiology (B. Sc.)	17116AEC53	Environmental Microbiology						
Microbiology (B. Sc.)	17116AEC54L	Food and Dairy Microbiology and Molecular Biology Lab						

Microbiology [illegible]	17116AEC55L	Environmental Microbiology Lab					
Microbiology [illegible]	17116DSC56__	Discipline Specific Elective -I					
Microbiology [illegible]	17116DSC56A	Immunotechnolgy					
Microbiology [illegible]	17116DSC56B	Bioinoculants					
Microbiology [illegible]	17116DSC56C	Intellectual Property Rights					
Microbiology [illegible]	17116BRC57	Participation in Bounded Research					
Microbiology [illegible]	171__SEC05__	Skill based Elective-V					
Microbiology [illegible]	17111SEC05L	Communicative English Lab-V					
Microbiology [illegible]	17116AEC61	Industrial Microbiology					
Microbiology [illegible]	17116SEC62	Clinical Microbiology					
Microbiology [illegible]	17116AEC63L	Industrial Microbiology Lab					
Microbiology [illegible]	17116SEC64L	Clinical Microbiology Lab					
Microbiology [illegible]	17116DSC65_	Discipline Specific Elective - II					

Microbiology M. Sc.,	17116DSC65A	Microbial Genetics					
Microbiology M. Sc.,	19116DSC65B	Bioethics					
Microbiology M. Sc.,	17116DSC65C	Bioremediation					
Microbiology M. Sc.,	171--GEC_	General Elective					
Microbiology M. Sc.,	17116PRW67	Project Work					
Microbiology M. Sc.,	171__SEC06__	Skill Based Elective – VI					
Microbiology M. Sc.,	17111SEC06L	Communicative English Lab-VI					
Microbiology M. Sc.,	17116EXACT	Extension activities					

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SCHOOL OF ARTS AND SCIENCE
DEPARTMENT OF MICROBIOLOGY

M. Sc., Syllabus-Regulation 2017

Academic year 2018- 2019
Mapping of courses to Cross cutting Issues

Programme Name & Code	Course Code	Title of the Course	Cross cutting issues: Human Values	Ethics	Values	Sustainability	Human Values
[illegible]	17216SEC11	Prokaryotic Microbiology		*			
[illegible]	17216SEC12	Eukaryotic Microbiology		*			
[illegible]	17216SEC13	Microbial Physiology			*		
[illegible]	17216SEC14L	Fundamentals of Microbiology Lab					*
[illegible]	17216DSC15_	Discipline Specific Elective					
[illegible]	17216DSC15A-	[illegible]			*		
[illegible]	17216DSC15B-	Bioremediation and Waste Management				*	
	17216RLC16	Research Led Seminar					
[illegible]	17216SEC21	Industrial Microbiology			*		
[illegible]	17216SEC22	Environmental and Agricultural Microbiology					
[illegible]	17216SEC23	Clinical Microbiology			*		
[illegible]	17216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab			*		

[illegible]	17216DSC25_	Discipline Specific Elective II					
[illegible]	17216RMC26	Research Methodology	*				
[illegible]	17216BRC27	Participation in Bounded Research	*				
[illegible]	17216DSC25A	Food and Diary Microbiology					*
[illegible]	17216 DSC25B	Bioreactor	*				
[illegible]	17216SEC31	Microbial Genetics	*				
[illegible]	17216SEC32	Molecular Biology and Microbial Biotechnology				*	
[illegible]	17216SEC33	Biostatistics and Bioinformatics					
[illegible]	17216SEC34L	Microbial Biotechnology Lab					
[illegible]	17216DSC35_	Discipline Specific Elective					
[illegible]	172_GEC	General Elective					
[illegible]	17216SRC37	Participation in Scaffold Research (Design/Societal Project)					
[illegible]	17216DSC35A	Pharmaceutical Microbiology					
[illegible]	17216DSC35B	Genetics and Genetic Engineering		*			
[illegible]	17216PRW41	Project Work					*

DEPARTMENT OF MICROBIOLOGY

M.PHIL MICROBIOLOGY SYLLABUS - REGULATION 2017

Cross cutting

[illegible] Code	[illegible]	[illegible]	[illegible]				
			Values	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	**173_ _ _11** (Common Paper)	Research Methodology					
[illegible]	**173MBC12**	Advanced Microbiology					

[illegible]	**173MBC13_**	A. Microbial Biotechnology				*	
[illegible]		B .Bioprocess and Enzyme Engineering					
[illegible]	CPE_RPE (Common Paper)	Research and Publication Ethics					*
[illegible]	**173MBC21**	Project Work					*

1.3.1 SUPPORTING DOCUMENTS

Courses (offered in 2018-19) which address the Gender Sensitization, Human Values, Professional Ethics, Environment and sustainability.

SCHOOL OF ARTS AND SCIENCE

DEPARTMENT OF MICROBIOLOGY

Gender Sensitization and Human Values	
Professional Ethics	
Human Values	
Environment and sustainability	
Professional Ethics & Human Values	

School of Arts and Science
Department of Microbiology
B. Sc., Syllabus-Regulation 2017

COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
	SEMESTER I				
17110AEC11/ 17111AEC11/ 17132AEC11/ 17135AEC11	Language-I (Tamil-I/ Advanced English-I/ Hindi-I/ French-I	4	0	0	2
17111AEC12	English-I	4	0	0	2
17116AEC13	Fundamentals of Microbiology	6	0	0	4
17116AEC14L	Fundamentals of Microbiology Lab	0	0	3	2
17115AEC15	Bio Chemistry I	6	1	0	5
17115AEC16L	Bio Chemistry I Lab	0	0	3	2
171 SEC01	Skill Based Elective-I	0	0	2	1
17111SEC01L	Communicative English Lab-I	0	0	1	1
171INDCONS	Indian Constitution	-	-	-	-
	Total	**20**	**1**	**9**	**19**
	SEMESTER II				
17110AEC21/ 17111AEC21/ 17132AEC21/ 17135AEC21	Language-II (Tamil-II/ Advanced English-II / Hindi-II/ French-II)	4	0	0	2
17111AEC22	English-II	4	0	0	2
17116AEC23	Microbial Physiology	6	1	0	4
17116AEC24L	Microbial Physiology Lab	0	0	3	2
17115AEC25	BioChemistry II	6	0	0	5
17115AEC26L	Bio Chemistry II Lab	0	0	3	2
17116RLC27	Research LED Seminar	-	-	-	1
171__SEC02__	Skill Based Elective –II	0	0	2	1
17111SEC02L	Communicative English Lab-II	0	0	1	1
	Total	**20**	**1**	**09**	**20**
	SEMESTER III				

17110AEC31/ 17111AEC31/ 17132AEC31/ 17135AEC31	Language-III (Tamil-III/ Advanced English-III / Hindi-III/ French-III)	4	0	0	2
17111AEC32	English-III	4	0	0	2
17116AEC33	Soil and Agriculture Microbiology	5	0	0	4
17116AEC34L	Soil and Agriculture Microbiology Lab	0	0	3	2
17112AEC35	Biostatistics	5	1	0	5
17112AEC36L	Biostatistics Lab	0	0	3	2
17116RMC37	Research Methodology	2	0	0	2
171 SEC03	Skill based Elective- III	0	0	2	1
17111SEC03L	Communicative English Lab-III	0	0	1	1
	Total	**20**	**1**	**09**	**21**
	SEMESTER IV				
17110AEC41/ 17111AEC41/ 17132AEC41/ 17135AEC41	Language-IV (Tamil-IV/ Advanced English-IV/ Hindi-IV/ French-IV)	4	0	0	2
17111AEC42	English-IV	4	0	0	2
17116AEC43	Virology	5	0	0	4
17116AEC44L	Soil Microbiology and Virology Lab	0	0	3	2
17116AEC45	Bioinformatics	6	0	0	5
17116AEC46L	Bioinformatics Lab	0	0	3	2
171__SEC04__	Skill based Elective- IV	0	0	2	1
17111SEC04L	Communicative English Lab-IV	0	0	1	1
171ENVTSTU	Environmental Studies	2	0	0	2
	Total	**21**	**0**	**9**	**21**
	SEMESTER V				
17116AEC51	Food and Dairy Microbiology	5	0	0	4
17116AEC52	Molecular Biology	5	0	0	3
17116AEC53	Environmental Microbiology	4	1	0	4
17116AEC54L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	2
17116AEC55L	Environmental Microbiology Lab	0	0	3	2
17116DSC56__	Discipline Specific Elective -I	5	0	0	3
17116BRC57	Participation in Bounded Research	-	-	-	1
171__SEC05__	Skill based Elective- V	0	0	2	1
17111SEC05L	Communicative English Lab-V	0	0	1	1
	Total	**19**	**1**	**9**	**21**
	SEMESTER VI				
17116AEC61	Industrial Microbiology	5	0	0	4
17116SEC62	Clinical Microbiology	5	0	0	5
17116AEC63L	Industrial Microbiology Lab	0	0	3	2
17116SEC64L	Clinical Microbiology Lab	0	0	3	2

17116DSC65_	Discipline Specific Elective - II	5	0	0	3
171--GEC_	General Elective	4	0	0	2
17116PRW67	Project Work	-	-	-	4
171__SEC06__	Skill Based Elective –VI	0	0	2	1
17111SEC06L	Communicative English Lab-VI	0	0	1	1
17116EXACT	Extension activities	-	-	-	-
	Total	**21**	**0**	**7**	**28**
	Total Credits for the Programme				**150**

Discipline Specific Electives

Semester	Discipline Specific Elective Courses-I
V	a) 17116DSC56A - Immunotechnolgy b) 17116DSC56B - Bioinoculants c) 17116DSC56C - Intellectual Property Rights
	Discipline Specific Elective Courses-I
VI	a) 17116DSC65A- a Microbial Genetics b) 17116DSC65B - Bioethics c) 17116DSC65C - Bioremediation

Skill based Electives

Semester	General Elective Courses
V	a) 17111GEC-Journalism b) 17112GEC-Development of Mathematical Skills c) 17113GEC-Instrumentation d) 17114GEC-Food and Adulteration e) 17120GEC-Web Technology f) 17122GEC-E-Commerce and its application g) 17161GEC-Indirect Taxes

Skill based Electives

Semester	Skill based Elective Courses
I	a) 17120SEC01AL-Package Lab – I b) 17160SEC01B-Soft skill – I
II	a) 17120SEC02AL-Package Lab – II b) 17160SEC02B-Soft skill – II
III	a) 17120SEC03AL-Package Lab –III b) 17160SEC03B-Soft skill – III
IV	a) 17120SEC04AL-Package Lab –IV b) 17160SEC04B- Soft skill – IV
V	a) 17120SEC05AL-Package Lab –V b) 17160SEC05B-Soft skill - V
VI	a) 17120SEC06AL-Package Lab –VI

	b) 17160SEC06B-Soft skill – VI

Credit Distribution

Sem	AEC	SEC	DSC	GEC	Research	Others	Ext Act	Total
I	20	2	-	-	-	1	-	23
II	20	2	-	-	1	-	-	23
III	19	2	-	-	3	-	-	24
IV	22	2	-	-	-	1	-	25
V	19	2	4	-	2	-	-	27
VI	08	9	4	2	4	-	1	28
Total	**108**	**19**	**8**	**2**	**10**	**2**	**1**	**150**

Course Code	Course Title	L	T	P	C
17110AEC11	Tamil-I	4	0	0	2

SEMESTER I

முதல் பருவம் - தாள் - 1

அலகு - I

பாரதியார் தேசபக்திப் பாடல்கள்

- சுதந்திரப் பெருமை
- சுதந்திரப் பயிர்
- சுதந்திர தேவியின் துதி
- தொண்டு செய்யும் அடிமை

பாரதிதாசன்

- வீரத்தாய்

அலகு -II

சுரதா - நல்ல தீர்ப்பு

கண்ணதாசன் - கந்தல் துணியின் கதை

பட்டுக்கோட்டை கல்யாணசுந்தரம் - நண்டு செய்த தொண்டு – காலம் சரியில்லே

மு.மேத்தா – வாழையடி வாழை

வாலி - தாய்

அலகு - III

சிறுகதை - இளவேனிற் குறிப்புகள் - திருவையாறு பாலகுமார்

அலகு - IV

இலக்கணம்

எழுத்து

மனப்பாடப்பகுதி

அலகு - V

இலக்கிய வரலாறு

சிறுகதை, புதினம், நாடகம், உரைநடை, கவிதை,புதுக்கவிதை

Course Code	Course Title	L	T	P	C
17111AEC11	Advanced English-I	4	0	0	2

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the glossary terms, figures of speech
- To improve vocabulary
- To learn how to edit and proof read
- To know the comparison and contrast and cause and effect forms
- To understand the impact of the speeches of famous people

Outcome:

- Develop vocabulary
- Read and comprehend literature

UNIT –I

Glossary of grammar terms

Figures of speech

UNIT – II

Foreign words and phrases

British and American Vocabulary

UNIT – III

Speeches of famous people:

Mahatma Gandhi-Abraham Lincoln-Swami Vivekananda-John F. Kennedy

UNIT – IV

Editing

Proof reading

UNIT – V

Comparison and contrast

Cause and effect

References:

English Grammar -Wren and Martin

English Grammar and Composition -Radhakrishna Pillai

Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons

English for writers and translators -Robin Macpherson

Technical Communication -Meenakshi Sharma & Sangeetha Sharma

The World's Great Speeches - Sudhir Kumar Sharma Galaxy Publishers

English Work Book-I&II -Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
17111AEC12	English-I	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To improve English delightfully through simple poems, essays
- To throw light on fiction
- To read and comprehend literature

Outcome:

- Read and comprehend literature

UNIT –I

The Art of Reading - Lin Yutang

An Eco-Feminist Vision -Aruna Gnanadason

UNIT – II

The Merchant of Death -Nanda Kishore Mishra & John Kennet

She Spoke for all Nature -Young world 'The Hindu'

UNIT –III

Because I could not Stop for Death -Emily Dickinson

Stopping by Woods on a Snowy Evening -Robert Frost

UNIT –IV

Enterprise -Nissim Ezekiel

Love poem for a wife -A.K Ramanujam

UNIT –V

Oliver Twist -Charles Dickens

References:-

The Art of Reading/ Experiencing Poetry. -S.Murugesan and Dr.K.Chellappan Emerald Publishers

Course Code	Course Title	L	T	P	C
17116AEC13	Fundamentals of Microbiology	6	1	0	6

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

1. Microbiology (1993) Jr. M.J. Pelczar, E.C.S. Chan and N.R. Kreig. Mc.Graw Hill Inc. New York
2. General Microbiology (1986). R.Y. Stainer, J.L. Ingraham and P.R.Painter. Mac Millan Education Ltd., London

Reference:

3. Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London

Course Code	Course Title	L	T	P	C
17116AEC14L	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
17115AEC15	Bio Chemistry I	5	0	0	5

Aim

To provide the basics of biochemistry and its application.

Objectives

It serves as good research techniques and the ability to combine and analyze information.

Outcomes

CO1 – To Develop fundamental knowledge about various biomolecules

CO2 - To Understand the basic concepts related to enzymes

CO3 - To Know various biochemical pathway

CO4 - To Understand the concept of microbial metabolism.

Unit I

Carbohydrates: Definition, Classification and Properties; Structural Elucidation of Glucose and fructose; Biological Functions of Glucose, fructose, starch, Cellulose, Chitin and Heparin.

Unit II

Amino acids: Structure, Classification, Properties.

Peptides: Amides and Peptides, Peptide bond, Peptide synthesis, Biologically important Peptides.

Proteins: Biological importance, Classification, properties; Structural orders; Protein stability; Separation and purification of proteins.

Unit III

Nucleotides and Polynucleotides; Terminology –Components.DNA and RNA – Composition, Structure, their biological importance.

Unit IV

Lipids: Biological Significance, Classification of lipids. Analysis of oils – Iodine Number, Saponification Value, Acid number, Acetyl value and Reichert-Meisel value; Qualitative Tests for Lipids.

Unit V

Vitamins: Source, Structure of Biological Role requirement, deficiency manifestation of fat soluble (A, D, E and K) and water soluble (B complexes and C) vitamins.

References:

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 , 25th edn., McGraw Hill.

Course Code	Course Title	L	T	P	C
17115AEC16L	Bio Chemistry I Lab	0	0	3	3

Aim

To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

To familiarize the students with the basic cellular processes at molecular level

Outcomes

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.

Skill Based Elective-I
MS-WORD

Course Code	Course Title	L	T	P	C
17120SEC01AL	Package Lab-I	0	0	2	1

1. Prepare a bio-data with photo using text styles.
2. Prepare a college course details with headings, bullets and numbering.
3. Prepare a document in a newspaper format with header and footer.
4. Create a calendar by using auto format.
5. Prepare a contemporary letter using templates.
6. picture insertion and alignment
    a. prepare a greeting card
    b. prepare a handout
7. Create a mark sheet using tables. And find out the total marks.
8. Prepare a business letter for more than one company using mail merge

Course Code	Course Title	L	T	P	C
17160SEC01B	Soft Skill I	0	0	2	1

Part- I Effective Communication

UNIT I **Effective communication I**

Oral Communication: Listening skills -Speaking skills (what to say and how to say it) – Gender neutral Language-Conflict, criticism, anger- Telephone skills.

UNIT II **Effective communication II**

Written Communication: Mechanics of writing, letters, notes, and reports- Resume preparation Faxes- Web sites- Email and Memos.

Nonverbal Communication: Behavior, Body language and Attitude.

Course Code	Course Title	L	T	P	C
17111SEC01L	Communicative English Lab -I	0	0	1	1

Aim:
- To acquaint with the basic grammar

Objective:
- To know English grammar and all the concomitant linguistic items
- To be aware of basic concepts related to the study of communication
- To understand the types of sentences and its patterns

Outcome:
- Understand grammar

UNIT –I
Noun
Pronoun
Adjective
UNIT – II
Verb
Adverb
UNIT –III
Conjunction
Preposition
Interjection
UNIT – IV
Kinds of Sentences
UNIT –V
Patterns of sentences

References:-
A Practical English Grammar -A.J Thomson and A.V.Martinet
English Grammar -Wren and Martin

Course Code	Course Title	L	T	P	C
171INDCONS	Indian Constitition	1	0	0	1

AIM:

To get full knowledge an Constitition

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.

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

Learning Out comes:

1.Democratic values and citizenship training are gained
2.Awareness on fundamental rights are established
3.The function of union government and state government are learnt
4.The power and functions of the judiciary are learnt thoroughly
5.Appreaciation of democratic parliamentary rule is learn

SEMESTER II

Course Code	Course Title	L	T	P	C
17110AEC21	Tamil-II	4	0	0	2

அலகு-I

திருஞானசம்பந்தர் தேவாரம் - இடரினும் தளரினும் - பதிகம்
திருநாவுக்கரசர் தேவாரம் - அன்னம் பாலிக்கும் தில்லை – பதிகம்
திருவாசகம் - கோயிற் திருப்பதிகம்
திருமந்திரம் - 25, 85, 139,238,250,252,270,724,2104,2716
திருஅருட்பா - தெய்வமணி மாலை 1,8,9

அலகு-II

நம்மாழ்வார் - 1 பாசுரம்- திருவாய்மொழி –எம்பெருமானுக்கு ஆட்படுதல் இன்பமே
பெரியாழ்வார் - 1 பாசுரம் - திருப்பல்லாண்டு – தாலப்பருவம்
நாச்சியார் திருமொழி - 10 பாடல்கள்- ஆறாம் திருமொழி

அலகு-III

சிற்றிலக்கியம் ,
முக்கூடற்பள்ளு - வளமை, செழுமை
மதுரை மீனாட்சியம்மை பிள்ளைத்தமிழ்- தாலப்பருவம்-ஐந்துபாடல்கள்

அலகு-IV

இலக்கணம் - சொல்
மனப்பாடப்பகுதி

அலகு-V

இலக்கிய வரலாறு
சைவ, வைணவ இலக்கியங்கள்
சிற்றிலக்கியம்.பள்ளு
பிள்ளைத்தமிழ்
பரணி

Course Code	Course Title	L	T	P	C
17111AEC21	Advanced English-II	4	0	0	2

Aim:
- To improve the knowledge of English

Objective:
- To understand the format of e-mail, fax and memos
- To write itinerary, checklist, invitation, circular, instruction, recommendations
- To understand the impact of the biographies of famous people

Outcome:
- Develop writing skill
- Read and comprehend literature

UNIT –I
E-mail
Fax
Memos
UNIT – II
Itinerary
Checklist
UNIT – III
Invitation
Circular
UNIT – IV
Instruction
Recommendations
UNIT – V
Biographies of famous people:
Mother Teresa-Madam Curie-Charles Chaplin-Vikram Sarabhai

References:

English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma
Inspiring Lives -Maruthi Publishers
English Work Book-I&II -Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
17111AEC22	English-II	4	0	0	2

Aim:

- To acquaint learners with different trends of writing

Objective:

- To empower students to acquire language skills through literature
- To enable the students to appreciate literature
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – I

Ecology -A.K. Ramanujan
Gift -Alice Walker
The First Meeting -Sujata Bhatt

UNIT –II

Fueled -Marcie Hans
Asleep -Ernst Jandl
Buying and selling -Khalil Gibran

UNIT –III

The End of living and The Beginning of Survival - Chief Seattle
My Wood - E.M.Forster
The Meeting of Races - Rabindranath Tagore

UNIT – IV

The Refugee -K.A. Abbas
I Have a Dream -Martin Luther king
Those People Next Door -A.G. Gardiner

UNIT – V

Marriage is a private Affair -Chinua Achebe
The Fortune Teller -Karel Capek
Proposal -Anton Chekov

References:-

Gathered Wisdom -GowriSivaraman EmeraldPublishers

Course Code	Course Title	L	T	P	C
17116AEC23	Microbial Physiology	6	1	0	6

Aim

- To instruct the importance of microbial metabolism and energetics for regulation and application of microbes in industry.

Objectives

- To understand the microbial growth and nutritional requirements.
- Studying the comprehensive awareness on metabolic process involved in prokaryotic and eukaryotic microorganisms.

Outcomes

CO1- To Determining the growth features of the microbes with various environmental factors.

CO2– To Analysis the essential nutrients ensuring microbial growth.

CO3 - To understand the significance of microbial surveillance

CO4- To know the Electron transport and metabolic pathway of living systems

Unit – I

Nutrition and growth of microorganisms: Nutritional types of microorganisms, nutritional requirements. Factors influencing the growth of microorganisms temperature, pH, Osmotic pressure, moisture, radiations and different chemicals. Physiology of growth – significance of various phases of growth - Growth Measurements – batch, continuous and synchronous

Unit – II

Bacterial enzymes – classification properties, coenzymes and cofactors isozymes

Unit – III

Metabolism of carbohydrates: Anabolism – plotosynthesis – 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 Books:

1 Pelczar Jr. M.J. Chan E.C.S. and Kroig N.R.(1993). Microbiology – Mcgraw Hill Inc., New York

2 Stainer R.Y., Ingraham J.L. Wheelia M.L. and Painter P.R. (1986). General Microbiology, Macmillan Education Ltd, London

3 Murray R.K., Cranner M.D., Mayea P.A. and Rodwell V.W.(1990). Biochemistry-prentice Hall International Inc., London

Reference:

1. Holt J.S., Krieg N.R., Sneath P.H.A and Williams S.T.(1994). Bergey's Menual of Determinative Bacteriology(9^{th} 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
17116AEC24L	Microbial Physiology Lab	0	0	3	2

Aim

- To study the nutritional requirements of microbes.

Objectives

- To study the growth pattern of bacteria
- To test the biochemical characterization of microbes.

Outcomes

CO1- To Understand and predict the various metabolic reactions in microbial cells.

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
17115AEC25	Bio Chemistry II	5	0	0	5

Aim

- To provide the basic of biochemistry and its application.

Objectives

- It serves as good research techniques and the ability to combine and 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
17115AEC26L	Bio Chemistry II Lab	0	0	3	3

Aim

- To make students familiar with practical techniques used for studying biochemical structure and analysis of biochemical methods.

Objectives

- To familiarize the students with the basic cellular processes at molecular level

Outcomes

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.

<u>References:</u>

1. Manuals in Biochemistry – J.Jayaraman
2. Manual in Biochemistry – S,Ramakrishnan
3. Practical Biochemistry – Plummer

Skill Based Elective-II
MS-EXCEL

Course Code	Course Title	L	T	P	C
17120SEC02AL	Package Lab-II	0	0	2	1

1. Prepare the addressing methods in excel
2. Describe the type of function
3. Draw a graph by using your own data
4. Prepare an Individual Pay Bill preparation for a employee in an organization.
5. Prepare a Mark list preparation for a student.
6. Prepare a Worksheet preparation for a company.
7. Prepare a Inventory Preparation
8. Prepare a Electricity Bill Preparation

Course Code	Course Title	L	T	P	C
17160SEC02B	SOFT SKILL II	0	0	2	1

Part -II Self Development

UNIT I: Self -Assessment

Self-Assessment, Self-Awareness, Self-Esteem, Personal success factors, handling failure, Depression and Habit, Self appraisal, SWOT analysis Perceptions and Attitudes, Positive Attitude, Values and Belief Systems, Personal Goal setting, Career Planning, Building of Self Confidence, prioritization.

UNIT II: Self- Management

Managing Time, Managing Stress, Conflict Management

Course Code	Course Title	L	T	P	C
17111SEC02L	Communicative English Lab-II	0	0	2	1

Aim:
- To acquaint with the basic grammar

Objective:
- To learn about the auxiliary and the models
- To understand the different tenses and use it in sentences
- To know where to use and where not to use the articles
- To familiarize with the participle

Outcome:
- Understand grammar

UNIT –1
Auxiliaries
UNIT –II
Modals
UNIT –III
Tenses-Simple, Perfect
UNIT –IV
Tenses-Continuous, Perfect continuous
UNIT –V
Articles
Participle

Reference

A Practical English Grammar -A.J Thomson and A.V.Martinet
English Grammar -Wren and Marti

SEMESTER – III

Course Code	Course Title	L	T	P	C
17110AEC31	Tamil-III	4	0	0	2

அலகு-I

சிலப்பதிகாரம்- வழக்குரை காதை
மணிமேகலை - ஆதிரை பிச்சையிட்ட காதை
சீவகசிந்தாமணி - நாட்டுவளம் 10 பாடல்கள்

அலகு-II
பெரியபுராணம்- மெய்ப்பொருள் நாயனார் புராணம்
கம்பராமாயணம் -வாலி வதைப்படலம்

அலகு-III
சீறாப்புராணம் - கரம் பொருத்து படலம்
இயேசுகாவியம் - மலைப்பொழிவு

அலகு-IV
இலக்கணம்- யாப்பு இலக்கணம்
மனப்பாடப்பகுதி

அலகு-V
இலக்கிய வரலாறு
காப்பியங்கள்
ஐஞ்சிறுகாப்பியங்கள்
புராணங்கள், இதிகாசங்கள்

Course Code	Course Title	L	T	P	C	Marks
17111AEC31	Advanced English-III	4	0	0	2	100

Aim:

- To improve the knowledge of English

Objective:

- To familiarize with the organs of speech and the description and classification of speech sounds
- To understand consonant cluster, syllable, word accent and intonation.
- To know how to interpret graphics
- To write slogans and advertisements

Outcome:

- Understand Phonetics
- Develop writing skill

UNIT –I

The organs of speech
Classification of speech sounds
Vowels and Diphthongs

UNIT –II

Consonants
Consonant cluster

UNIT – III

Syllable
Word accent
Intonation

UNIT – IV

Idiom
Interpretation of graphics

UNIT – V

Slogan writing
Writing advertisement

References:

English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma
A text book of Phonetics for Indian Students -T.B. Balasubramaniyan

Course Code	Course Title	L	T	P	C
17111AEC32	English-III	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To sensitize students to language use through prescribed text
- To develop the conversational skills through one act plays

Outcome:

- Read and comprehend literature

UNIT – 1

The Doctor's World - R.K. Narayan
The Postmaster - Rabindranath Tagore
Princess September - E.Somerest Maugham

UNIT – II

The Price of Flowers -Prabhat Kumar Mukhopadhyay
The Open Window -Saki
The Model Millionaire -Oscar Wilde

UNIT –III

My Brother My Brother - Norah Burke
Uneasy Home Coming - Will F. Jenkins
Resignation - Premchand

UNIT –IV

The Referee -W.H. Andrews & Geoffrey Dreamer
The Case of the Stolen Diamonds -Farrell Mitchell

UNIT – V

The Dear Departed -Stanley Houghton
The Princess and the Wood Cutter -Alan Alexander Milne

References:-

Nine Short Stories -Steuart H.King Blackie Books
One-Act plays of Today -T.Prabhakar Emerald Publishers

Course Code	Course Title	L	T	P	C
17116AEC33	Soil and Agriculture Microbiology	5	0	0	5

Aim:

To learn about microorganisms in the environment and their importance in soil and agriculture.

Objectives

- To know the microbes in various environments like soil, water and air.
- Importance of microbes in agriculture and waste treatment.

Outcome

CO1 - To acquire the information about microbes

CO2 - To Know about microbes and its role in the 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 (bacteria, fungi, algae and nematodes in relevance to soil types).

UNIT – II

Interactions among microorganisms. Symbiosis – mutualism – commensalisms – competition – amensalism – synergism – parasitism – predation.

UNTI – III

Biogeochemical cycles. Carbon, nitrogen, phosphorus and sulphur.

UNIT – IV

Biofertilizers. Symbiotic nitrogen fixation – (*Rhizobium, Frankia*) –Symbiotic nutrient mobilizers – Endomycorrhizae and Ectomycorrizae – Non symbiotic microbes – *Azotobacter* – *Azospirillum* – Cyanobacteria (*Nostoc. Gloeocapsa Anabaena)*.

UNIT – V

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.

Text Book:

1. Alexander, M.(1971). Microbial Ecology. John Wiley & Sons, Inc., New York
2. Alexander, M.(1977). Introduction to Soil Microbiology. John Wiley & Sons, Inc., New York.

Reference:

1. Norris, J.R and Pettipher, G.L.(1987). Essays in Agricultural and Food Microbiology, John wiley and Sons, Singapore.
2. Harold J.Benson, 1994. Microbiological applications. Wm.C.Brown Publishers, Melbourne, Australia.

3. James G.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub.Co., California.
4. Burges, A. and Raw, F. 1967. Soil Biology. Academic Press, London.
5. Martin Alexander Wiley. 1961. Introduction to Soil Microbiology. International Edn., New York.
6. Vanghan, D. and Malcolm, R.E.1985. Soil Organic Matter and Biological Activity. Martinus Nighoff W.Junk Publishers.
7. Mashal, K.D.1985. Advances in Microbial Ecology. Plenum Press, New York.
8. Harry Buckman and Nyle C.Brady. 1960. The Nature and properties of Soil. Eurasia Pub. House (Pvt.) Ltd., New Delhi.

Course Code	Course Title	L	T	P	C
17116AEC34L	Soil and Agriculture Microbiology Lab	0	0	3	3

Aim:

To analyze microbiological quality of food samples.

Objectives

- Microbiological tests used in the food industry.
- To study and characterize the food borne microorganisms.

Outcome

CO1 - To Analyze the microbes in food and dairy industry products

CO2 - To understand the Production methods of Food and dairy products using microbes

CO3 - To gain Knowledge about Molecular Genome analysis and quantification

CO4 - To understand the Isolation of DNA and amplification using PCR technique.

CO5 - To know about Protein and DNA separation technique

Lab work

1. Isolation and culturing of *Rhizobium* from root nodules.
2. Isolation and culturing of *Azospirillum* from grass plant.
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

Demonstrations

1. Testing nodulation ability of *Rhizobium.*
2. Seed inoculation with *Rhizobium* and testing of nodulation ability.
3. Study of the following diseases:
    - Bacterial blight of paddy;
    - Downy mildew of bajra;
    - Powdery mildew of cucurbits;
    - Head smut of sorghum;
    - Leaf rust of coffee;
    - Leaf spot of mulberry,
    - Red rot of sugarcane,
    - Root knot of mulberry

Course Code	Course Title	L	T	P	C
17112AEC35	Biostatistics	4	0	0	4

Aim:

To represents an introduction to the field and provides a survey of data and data types.

Objectives

- Recognize and give examples of different types of data arising in public health and clinical studies
- Interpret differences in data distributions via visual displays
- Calculate standard normal scores and resulting probabilities

Outcomes

- Distinguish, calculate, and interpret measures of occurrence of diseases, including prevalence, incidence, risk, and odds of disease.

Unit – I

Use of statistics in biology – Measures of Central tendency – Mean, Median, Mode, Measure of dispersion Standard deviation – Standard error – Correlation Coefficient - Probability

Unit – II

Marginal conditional distribution – continuous and discrete distribution – Regression analysis – ‘t’ test, Chi-Square test, binomial, Normal and exponential, Biostat program.

Unit – III

Null hypothesis, level of significance, test of significance for mean / different

Unit – IV

Curve fitting – least square method – finite differences – difference operators – Newton's forward and backward formula, Basics of the application of SPSS 7.5 window software package

Unit – V

MS Excel for computing data – Newton Raphson method, false position method – Solution of simultaneous algebraic equation.

Reference:

1. Introduction to numerical methods 1990 S. Shasta
2. Computer Oriented numerical methods 1971 V. Rajaraman
3. Introduction to Biostatistics by Sokal and Rohit 1973 Toppan Co. Japan

Course Code	Course Title	L	T	P	C
17112AEC36L	Biostatistics Lab	0	0	3	3

Aim:

- To represents an introduction to the field and provides a survey of data and data types.

Objectives

- Recognize and give examples of different types of data arising in public health and clinical studies
- Interpret differences in data distributions via visual displays
- Calculate standard normal scores and resulting probabilities

Outcomes

Distinguish, calculate, and interpret measures of occurrence of diseases, including prevalence, incidence, risk, and odds of disease.

1. Mean and Standard deviation using biological samples
2. Chi – Square test, Student ‘t’ test and Correlation coefficient
3. Regression Coefficient and regression lines

Course Code	Course Title	L	T	P	C
17116RMC37	Research Methodology	3	0	0	3

AIM:

To create a basic appreciation towards research process and awareness of various research publication

OBJECTIVES:

- To understand the steps in research process and the suitable methods.
- To identify various research communications and their salient features
- To carry out basic literature survey using the common data-bases
- To give exposure to MATLAB platform for effective computational and graphic works required for quality research

OUTCOME:

Ability to carry out independent literature survey corresponding to the specific publication type and assess basic computational frameworks used in mathematical researches.

PREREQUISITES:

Basic computer literacy & skills for working in window-environment

UNIT I: Introduction to Research Methodology

Meaning of research – Objectives of research – Types of research – Significance of research – Research approaches

UNIT II: Research Methods

Research methods versus methodology – Research and scientific method – Criteria of good research – Problems encountered by researchers in India.

UNIT III: Literature Survey

Articles – Thesis – Journals – Patents – Primary sources of journals and patents – Secondary sources – Listing of titles – Abstracts – Reviews – General treatises – Monographs.

UNIT IV: Database Survey

Database search – NIST – MSDS – PubMed – Scopus – Science citation index – Information about a specific search.

UNIT V:

Basic Principles of Laboratory Safety and Waste management

Introduction - Access to Laboratory and Emergency Exits - Personal Protective Clothing and Equipment - Good Working Practices-Maintenance of Laboratory Equipment - Working with Hazardous Substances - Storage of Chemicals - Working with Flammable Solvents - Gas Cylinders-Fire Precautions - Emergency Procedures - First Aid - Accident Follow-Up - Safety Manual - Safety Training - Management of Laboratory Safety and Responsibilities - Waste Management.

Skill Based Elective-III

POWER POINT

Course Code	Course Title	L	T	P	C
17120SEC03AL	Package Lab-III	0	0	2	1

1. Create a slide show presentation for a seminar (choose your own topics)
    a. Enter the text in the outline view
    b. Create Non-bulleted and bulleted text
2. Create a slide show presentation for a science exhibition
    a. Create Non-bulleted and bulleted text
    b. Apply appropriate text attributes
3. Create slide show presentation for an invitation
    a. Insert an object from a bitmap file
    b. Apply appropriate text attributes
    c. Rotate the object to 45 degree
    d. Apply shadow to the object
4. Create a slide show presentation to display percentage of marks in each semester for all students
    a. Use bar chart (x-axis: semester; y-axis: % of marks)
    b. Use different presentation template and different transition effect for each slide
    c. Use different text attributes in each slide
5. ***Create a slide show presentation for a shop advertisement to be open shortly***
6. Create a slide show presentation to display percentage of sales in each quarter for the any vendor using bar chart (x-axis: Quarter; y-axis: % of sales)
7. Create a slide show presentation for a tourists places
8. Create a slide for calendar using appropriate text attributes and insert an object from a bitmap file

Course Code	Course Title	L	T	P	C
17160SEC03B	SOFT SKILL III	0	0	2	1

Part -III Interpersonal Relations and Social Responsibilities

UNIT I: Interpersonal Relations

Nature of groups and teams, Team effectiveness, Group discussions and decision making, Emotional Intelligence (EI) and Emotional Quotients (EQ), and its effect on team, Cross Cultural Aspects, Inter dependence, Peer Reviews.

UNIT II: Ethics and Social Responsibilities

Personal professional and corporate ethics, Ethical dilemma, Corporate social responsibilities: Green computing, Social accounting, Auditing, Civic sense.

Course Code	Course Title	L	T	P	C
17111SEC03L	Communicative English Lab-III	0	0	2	1

Aim:

- To acquaint with the basic grammar

Objective:

- To familiarize with the clauses and phrases
- To learn the different degrees of comparison
- To change a sentence from active to passive and vice versa
- To know where to use punctuations
- To frame sentences
- To know the features, process, forms and barriers of communication

Outcome:

- Understand grammar

UNIT –1
Clauses
Phrases

UNIT –II
Degrees of comparison

UNIT –III
Active and Passive

UNIT –IV
Communication
Characteristics -Process -Forms - Barriers

UNIT –V
Punctuation
Forming sentences

References:-

A Practical English Grammar -A.J Thomson and A.V. Martinet
English Grammar - Wren and Martin
Technical Communication -Meenakshi Sharma & Sangeetha Sharma

SEMESTER – IV

Course Code	Course Title	L	T	P	C
17110AEC41	Tamil-IV	4	0	0	2

அலகு-I

எட்டுத்தொகை
நற்றிணை - குறிஞ்சி 356,முல்லை-242, பாலை-397
குறுந்தொகை- 2,18,25,58,67,69,135,167,283,373
ஐங்குறுநூறு- சிறுவெண் காக்கைப் பத்து

அலகு-II
கலித்தொகை- பாலை 34,குறிஞ்சி-51,நெய்தல்-133
அகநானூறு - 36,147,332
புறநானூறு- 34,173,189,235,279

அலகு-III
முல்லைப்பாட்டு - முழுவதும்
திருக்குறள்- ஐந்து அதிகாரம்-
அறம் 2,பொருள் 2,இன்பம் -1 வான்சிறப்பு,அழுக்காறாமை,இறைமாட்சி,கூடாநட்பு,காதற்சிறப்புரைத்தல்

அலகு-IV
இலக்கணம் அணி

மனப்பாடப்பகுதி

அலகு-V
இலக்கிய வரலாறு
எட்டுத்தொகை
பத்துப்பாட்டு
அறஇலக்கியங்கள்

Course Code	Course Title	L	T	P	C
17111AEC41	Advanced English-IV	4	0	0	2

Aim:
- To improve the knowledge of English

Objective:
- To familiarize with the objectives and types of interview
- To know the types of questions and answering techniques
- To prepare reviews and proposals
- To learn the grammatical forms
- To understand the meaning of a poem and write the content
- To write for and against a topic
- To draw a flowchart
- To write definitions

Outcome:
- Develop communicative skill
- Read and comprehend literature

UNIT –I
Interviews
Objectives, types, ten success factors, ten failure factors - Planning and preparation –Presentation– Type of questions – Answering techniques.

UNIT – II
Flowchart
Proposals

UNIT – III
Discourse markers
Review

UNIT IV
Grammatical forms
Paraphrasing

UNIT –V
Definition
Writing for and against a topic.

References:

English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Essentials of Business Communication -Rajendra Pal &J.S Korlahalli Sultan Chand & Sons
Technical Communication -Meenakshi Sharma & Sangeetha Sharma
English for writers and translators -Robin Macpherson
English Work Book-I&II -Jewelcy Jawahar

Course Code	Course Title	L	T	P	C
17111AEC42	English-IV	4	0	0	2

Aim:

- To acquaint students with learning English through literature

Objective:

- To introduce learners to the standard literary texts
- To impart wisdom through morally sound poems and essays
- To introduce Shakespeare to non-literature students

Outcome:

- Read and comprehend literature

UNIT –I

How to be a Doctor -Stephen Leacock
My Visions for India -A.P.J. Abdul Kalam
Woman, not the weaker sex -M.K. Gandhi

UNIT –II

My Last Duchess -Robert Browning
The Toys -Coventry Patmore
I, too -Langston Hughes

UNIT –III

The Best Investment I ever made-A.J.Cronin
The Verger -W.S Maugham
A Willing Slave -R.K.Narayan

UNIT –IV

Macbeth
As You Like It

UNIT –V

Henry IV
Tempest

References:-

English for Enrichment -.Devaraj Emerald Publishers
Selected Scenes from Shakespeare Book I &II -Emerald Publishers

Course Code	Course Title	L	T	P	C
17116AEC43	Virology	6	0	0	6

Aim:

- To study the general aspects of viral morphology

Objectives

- To study general aspects of viral morphology and classification, replication, interactions and immunity to viruses
- To discuss the application of various immunological and molecular diagnostic tools.

Outcomes

- This paper will have clear understanding the role of various in plant, animal and human disease
- Candidates are able to understand their various mechanisms to enter and escape fromhost.

UNIT – I

Introduction – Definition, History of virology. General properties of Viruses classification of Viruses – cultivation of Viruses – Structure and replications Viruses.

UNIT - II

Virus: Assay, purification and characterization of Viruses, Separation and characterization of viral components and quantification of Viruses.

UNIT – III

Bacterial Viruses – structure of bacteriophage, The Lytic life cycle (T-Even coliphages) – Lysogenic life cycle (*Escherchia coli*, Phage Lambda) noninteractive lysogeny (*Escheirchia coli*).

UNIT – IV

Plant Viruses, common plant viral diseases: TMV, Bunchy top of banana, satellite virus, Viroid – Double stranded DNA virus – Assay methods.

UNIT – V

Animal viruses: Morphology, pathogenesis and laboratory diagnosis of Prions,Animal viruses Rinderpest, Blue tongue, Ranikhet dion, Foot and Mouth Disease. Human Viruses – Herpes, HIV, Hepatitis Viruses. Viral Vaccines. Prevention and treatment of viral diseases. Antiviral agents.

Text book

1. Dimmock N.J.Primrose S.B.(1994). Introduction to Modern Virology. IV edition. Blackwell scientific Publications, Oxford.

2. Topley & Wilson's(1990). Principles of Bacteriology, Virology and Immunity. VIII edition Vol.IV Virology, Edward Arnold, London.

3. Morag, C.Timbury(1994). Medical Virology. X edition. Churchill Livingston.

References

4. Maloy S.R.Cronam Jr.J.E.Freifleder D. (1994). Microbial Genetics. Jones and Bartlett.Publishers.

5. Conrat., H.F.Kimball, P.C. and Levy, J.A.(1988). Virology. II Edition. Prentice Hall, Englewood cliff, New Jersey.

6. Harold J.Benson. 1994. Microbiological Applications. Wm.C.Brown Publishers, Melbourne, Austrialia.

7. James, C.Cappuccino. 1996. Microbiology. The Benjamin/Cummings Pub. Co. Calfornia.

Course Code	Course Title	L	T	P	C
17116AEC44L	Soil Microbiology and Virology Lab	0	0	3	3

Aim:

To study the general aspects of virus

Objectives

- To study general aspects of viral morphology and classification.
- Cultivation of viruses and various methods of propagation.
- To discuss the application of various immunological and molecular diagnostic tools

Outcomes

- Upon paper completion, students will have knowledge on the structure of plants, animals, bacteria and viruses.
- This paper also enables the student on isolation, propagation of various viruses.

Lab work

1. Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes).
2. Isolation and staining of vesicular arbuscular mycorrhizae from roots of higher plants.
3. Isolation and testing of antagonistic microorganisms from soil
4. Isolation of microorganisms from Rhizosphere and Rhizoplane
5. Determination of soil pH
6. Estimation of soil chlorides.
7. Estimation of soil calcium.
8. Estimation of magnesium
9. Estimation total phosphorus.
10. Isolation & characterization of bacteriophage from natural resources.

Demonstrations

1. Isolation of microorganisms from the 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
17116AEC45	Bioinformatics	6	0	0	6

Aim:

To learn about the bioinformatics databases, databanks, data format and data retrieval from the online sources.

Objectives

- To make students understand the essential features of the interdisciplinary field of science¬ for better understanding biological data.
- To provide the student with a strong foundation for performing further research in bioinformatics.

Unit – I

Introduction to Bioinformatics – Scope and application – Characteristics of Hardware and Software – Types of computer – Sending and receiving e-mails – Internet searching biological articles in internet

Unit – II

Computer application in biology – Information theory and biology – Analysis tools for databases – BLAST, FASTA and DNA database – NCBI, DDBJ and EMBL.

Unit – III

Protein structure determination by X- ray diffraction methods – Sequence alignment – Global alignment using Needleman – Wunsch algorithm and Local alignment using Smith – Waterman algorithm

Unit – IV

Application to DNA and protein sequence – Biochips, Biosensors.

Unit – V

Use of databases in biology: Sequence databases, structure databases. Sequence analysis – Protein and nucleic acids, Structure comparisons, molecular modeling, genome projects

Reference:

1. Molecular databases for protein sequence and structure studies by Silliance M and Silliance M 1991 Springer Verlag
2. Sequence Analysis primer by M.Gnibskov, J.Devereux 1989 Stockton press
3. Computational Methods in Mol.Biol/Now comprehensive Biochemistry Vol.32. S.C. Seizberg DB Searls, S.Kasif Elsevier 1998.
4. Comutational methods for macromolecular analysis 1996 methods in Enzymology Vol.266 by R.F. Dorlittle Academic press.

Course Code	Course Title	L	T	P	C
17116AEC46L	Bioinformatics Lab	0	0	3	3

Aim:

To learn about the bioinformatics databases, databanks and data format data retrieval from the online sources.

Objectives

To make students understand the essential features of the interdisciplinary field of science for better understanding biological data.

1. Pairwise alignment using FASTA, BLAST.
2. Multiple alignments using Clustal W.
3. Study of internet resources in Bioinformatics – NCBI, ENBL, EBI.

Skill Based Elective IV
MS-ACCESS

Course Code	Course Title	L	T	P	C
17120SEC04AL	Package Lab-IV	0	0	2	1

1. Create a database and a simple table
2. Create a database for sorting the marks scored by the student in the universality exams
3. Create a database for sorting the date of joining by the employee in the organization.
4. Create queries to select records that matches specific condition
5. Create relationships among the different tables
6. Create queries using built-in functions
7. Develop forms to enter data in to the student marks database
8. Develop forms to enter data in to the employee database

Course Code	Course Title	L	T	P	C
17160SEC04B	SOFT SKILL IV	0	0	2	1

PART -IV Etiquette And Interviewing Skills

UNIT I Corporate

Corporate grooming and dressing, Etiquettes in social as well as office settings, Email Etiquettes, Telephone Etiquettes, Contemporary issues in corporate life: diversity, Attrition, Work life balance, Hygiene and health.

UNIT II Interviewing Skills

Researching the job-Researching the company -Questions to research the company-Informational interviews-Behavioral interviewing- Types of interview (Individual interviews, panel interviews, serial interviews, video interviews and teleconferencing) references-selling yourself-dressing for success-body language-stress reduction-Handling illegal questions.

Course Code	Course Title	L	T	P	C
17111SCE04L	Communicative English Lab-IV	0	0	1	1

Aim:

- To develop communicative skills

Objective:

- To use gerund and make sentences
- To change sentences from direct to indirect and vice versa
- To understand the listening skill
- To enhance reading skill
- To familiarize with the singular and plural forms
- To describe a picture

Outcome:

- Understand grammar
- Develop listening and reading skills

UNIT –I

Gerund

Infinitive

UNIT –II

Direct and Indirect

UNIT –III

Listening -types-features of a good listener-active and passive listening-effective listening

UNIT –IV

Reading-purpose-technique-types-reading rates-reading & interpretation

UNIT –V

Singular and Plural

Letter writing

References:-

A Practical English Grammar -A.J Thomson and A.V. Martinet

English Grammar -Wren and Martin

Technical Communication -Meenakshi Sharma & Sangeetha Sharma

ENVIRONMENTAL STUDIES
(for under graduate students)

Course Code	Course Title	L	T	P	C
171ENVTSTU	Environmental Studies	1	0	0	1

AIM

To get the full knowledge of environment

Objectives:

- Creating 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 the public to participate in environment protection and environment improvement.
- Acquiring skills to help the concerned individuals in identifying and solving environmental problems.
- Striving to attain harmony with Nature.

1. **Nature of Environmental Studies**

Definition, scope and importance.
Multidisciplinary nature of environmental studies
Need for public awareness.

2. **Natural Resources and Associated Problems.**

a) Forest resources: Use and over — exploitation, deforestation, dams and their effects on forests and tribal people.
b) Water resources: Use and over — utilization Of surface and ground water, floods, drought, conflicts over water, dams benefits and problems.
c) Mineral resources: Usage and exploitation. Environmental effects of extracting and using mineral resources.
d) Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer — pesticide problems.
e) Energy resources: Growing energy needs, renewable and non — renewable energy resources, use of alternate energy sources. Solar energy, Biomass energy, Nuclear energy.
f) Land resources: Solar energy, Biomass energy, Nuclear energy, Land as a resource, land degradation, man induced landslides, soil erosion and desertification,

Role of an individuals in conservation of natural resources.

3. **Ecosystems**

Concept of an ecosystem.
Structure and function of an ecosystem.
Producers, consumers and decomposers.

Energy flow in the ecosystem.
Ecological succession.
Food chains, food webs and ecological pyramids.
Introduction, types, characteristics features, structure and function of the following ecosystem:
a) Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem,
d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

4. Biodiversity and its conservation

Introduction — Definition: genetic, species and ecosystem diversity.
Bio — geographical classification of India.
Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
India as a mega — diversity nation.
Western Ghat as a biodiversity region.
Hot— spot of biodiversity.
Threats to biodiversity habitat loss, poaching of wildlife, man — wildlife conflicts.
Endangered and endemic species of India.
Conservation of biodiversity: In — situ and Ex — situ conservation of biodiversity.

5. **Environmental Pollution**

Definition: Causes, effects and control measures of: Air pollution, Water pollution, soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards.
Solid waste Management: Causes, effects and control measures of urban and industrial wastes. Role of a individual in prevention of pollution.

6. **Social Issues and the Environment**

Disaster management: floods, earthquake, cyclone, tsunami and landslides.
Urban problems related to energy Water conservation, rain water harvesting, watershed management
Resettlement and rehabilitation of people; its problems and concerns.
Environmental ethics: Issue and possible solutions.
Global wanTling, acid rain, ozone layer depletion, nuclear accidents and holocaust.
Wasteland reclamation.
Consumerism and waste products.

7. Environmental Protection

From Unsustainable to Sustainable development.
Environmental Protection Act.
Air (Prevention and Control of Pollution) Act.
Water (Prevention and control of Pollution) Act.
Wildlife Protection Act.
Forest Conservation Act.
Population Growth and Human Health, Human Rights.

8. Field Work

Visit to a local area to document environmental assets — River / Forest / Grassland / Hill / Mountain.

or

Visit to a local polluted site — Urban / Rural *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.

SEMESTER V

Course Code	Course Title	L	T	P	C
17116AEC51	Food and Dairy Microbiology	5	0	0	5

Aim:

- To learn about the epidemiology of foodborne diseases and the pathogens.

Objectives

- To learn about food spoilage factors
- To know the preservation methods
- To make aware of food borne disease

Outcomes

- Better understanding of cause of microbes in food spoilage
- Get information regarding food preservation
- Enable them to work food fermentation industries

UNIT – 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 Book

1. Adams, M.R. and Moss, M.O.1995. Food Microbiology, The Royal Society of Chemistry, Cambridge.
2. Frazier, W.C. and Westhoff, D.C.1988. Food Microbiology, TATA McGraw Hill Publishing company ltd., New Delhi.
3. Jay, J.M.1987. Modern Food Microbiology. CBS Publishers and distributors, New Delhi.

4. Atlas, R.M. 1989. Microbiology, A Fundamentals and Applications, Macmillian Publishing company.

Reference:

1. Banwart, G.J.1989. Basic Food Microbiology, Chapman & Hall New York.
2. Board, R.C.1983. A Modern Introduction to Food Microbiology, Blackwell Scientific Publications, Oxford.
3. Robinson, R.K.1990. Dairy Microbiology, Elsevier Applied Science, London.
4. Hobbs, B.C. and Roberts, D.1993. Food Poisiong and Food Hygiene, Edward Arnold (A division of Hodder and Stoughton), London.

Course Code	Course Title	L	T	P	C
17116AEC52	Molecular Biology	5	0	0	5

Aim:

- To introduce the fundamentals and basic biology of life.

Objectives

- To learn the basic principles of inheritance at the molecular, cellular and organismal levels.
- To understand causal relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical" genetics)
- To test and deepen their mastery of genetics by applying this knowledge in a variety of problem-solving situations

Outcomes

- It will elaborate the central dogma of the cell i.e., gene expression viz. transcription and translation in both prokaryotes and eukaryotes.

UNIT – I

Nucleic acids: Structure of DNA and RNA, Types and forms – DNA, t-RNA, r-RNA, m-RNA – Definition and functions.

UNIT – II

Vectors – plasmids, phages and cosmids, Ti-plasmid, pBR322, pSC101, pUC. Structure and assay methods.

UNIT – III

Enzymes – Nucleases, ligases, polymerases, DNA modifying enzymes, Topoisomerases – their uses and applications.

UNIT – IV

Gene and its manipulation techniques – Definition of a gene, structure, cloning techniques, genomic library, C-DNA, expression systems. Gene rearrangement by RNA and DNA splicing.

UNIT – V

Nucleic acid and protein hybridization technique – Southern, Northern and Western methods of hybridization. DNA amplification techniques – PCR. DNA fingerprinting and its applications.

Text Book

1. Watson, JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AAM. 1987. Molecular Biology of the Gene. The Benjamin/Cummings publishing company.
2. Lewin B.1994. Genes V.Oxford University press.
3. Lodish, H, Baltimore D, Berk A, Zipursky SL, Matsudaira P, Darnell J. 1995. Molecurlar Cell Biology. Scientific American Books.
4. Freifelder D. 1991 Molecular Biology. Narosa Publishing Home
5. R.S.Old and S.B.Primrose. 1989. Principles of Gene Manipulation, 4th Ed., Blackwell Scientific Publications, London.

Reference

1. Maloy SR, Cronan Jr.JE, Freifelder D.1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1992 Nucleic acids and Molecular Biology – Springer – Verlag.
3. Blackburn CM, Gait MJ. 1996. Nucleic acids in Chemistry and Biology – Oxford University Press.
4. Stryer L.1995. Biochemistry. W.H.Freeman and company.
5. Eckstein F, Lilley DM.1996 Catalytic RNA – Springer – Verlag.
6. 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
17116AEC53	Environmental Microbiology	4	1	0	3

Aim:

- To learn about microorganisms in environment

Objectives

- To know the role of microbes in environmental field
- To get information on aquatic Microorganism

Outcome

- Students acquire the information about microbes
- Know about microbes and their role in the environment.
- Able to understand about microbes in agriculture and environmental field

UNIT – I

Concepts of microbial ecology: Relationship between microorganism and different environments land, water and air. Microorganisms inhabiting extreme environments. Microbiology of air – organisms in air, distribution and sources. Droplet nuclei, aerosol, assessment of air quality, solid – liquid – impingement methods. Brief account of air borne transmission of harmful microbes.

UNIT – II

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 – III

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).

UNIT – IV

Liquid waste treatment. Treatment methods – primary –secondary (anaerobic – methanogenesis; aerobic- trickling activated sludge – oxidation pond – tertiary treatment. Utilization of liquid wastes – food (SCP, Yeast) – fuel (methane), fertilizers (Cyanobacteria).

UNIT – V

Biodeterioration: Deterioration of paper, leather, wood, textiles, metal corrosion, mode of deterioration, organisms involved its disadvantages and mode of prevention.

Text Book:

1. Ec Eldowney, S., Hardman, D.J. and Waite, S. 1993. Pollution: Ecology and Biotreatment – Longman Scientific Technical
2. Baker, W.C. and Herson, D.S.1994. Bioremediations – McGraw Hill Inc., New York
3. Ernest, W.C.1982. The Environment of the Deep sea, 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. William M., Lewis Jr. James. F. Saunders. David W. Crumpacker. Sr. and Charles Brebdecke., 1994. Ecologicla Studies – Vol 46.
6. Bernt Zeitzschel, Sebastian A. Gerlach 1973. The Biology of Indian Ocean. Ecological studies. Vol. III

7. W. Nybakken, 1982. Marine Biology – An Ecological Approach. Ames Harper and Row Publisher, New York.
8. K. C. Marshall, 1985. Advances in Microbial Ecology. Vol-8. Plenum press.
9. Burns, R.C. and Slater, J.H. 1982. Experimental Microbial Ecology – Blackwell Scientific Publications, Oxford, London.

Course Code	Course Title	L	T	P	C
17116AEC54L	Food and Dairy Microbiology and Molecular Biology Lab	0	0	3	3

Aim:

To analyze results for routine microbiological samples.

Objectives

- Apply analyses used commonly in the food industry.
- Correctly predict the types and levels of organisms commonly occurring in different foods.
- Clearly communicate in different oral and written formats, to different audiences, the results of laboratory analyses in food microbiology.

Lab work

1. Assessment of milk quality by methylene blue reduction test
2. Wet mount preparation of fungal organisms from spoiled bread, tomato, grapes, potato.
3. Observation of food samples to *study Leuconostoc sp. Lactobacillus sp., Streptococcus lactase* and *Saccharomyces*
4. Preparation of yogurt
5. Determination of thermal death time (TDT) and thermal death point (TIP) of microorganisms from spoiled foods
6. Direct microscopic examination of milk by standard plate count(SPC) method
7. Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
8. Isolation of chromosomal DNA from bacteria by Spectrophotometric assay.
9. Development of competent cells in ***E. coli***.
10. Isolation of antibiotic resistant auxotrophic mutants.
11. Protoplast and Spheroplast isolation

Demonstration

1. Fermenting ability of yeast
2. Antibiotic resistance – plasmid mediated – chromosomal mediated – Gel Electrophoretic methods.
3. Principles and applications of agarose gel electrophoresis and plasmid sepearation in agarose gel.

Course Code	Course Title	L	T	P	C
17116AEC55L	Environmental Microbiology Lab	0	0	3	3

Aim:

- To use appropriate lab techniques and analyze results for routine microbiological samples

Objectives

- To know the role of microbes in environmental field
- To get information on aquatic Microorganism

Outcome

- Students acquire the information about microbes
- Know about microbes and its role in environment

Lab work

1. Isolation and identification of air-borne bio-particles using Open plate method
2. Effects of high salt concentration on microbial growth
3. Microbial flora of polluted water – Microbial flora of sewage
4. Bacterial examination of drinking water by membrane filter technique and MPN

Discipline Specific Elective -I

Course Code	Course Title	L	T	P	C
17116DSC56A	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 immunodiagnostic 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: Terminologies – History of Immunology – immunity – types of immunity – innate and acquired. Immunohemotology, Blood groups, Blood transfusion – Rh – incompatibilities

UNIT – II

Immune systems: Anatomy of lympho- recticular system – Primary lymphoid organ. Secondary lymphoid tissue – cells of the immue system – detailed aspects of T and B cells – receptors – activation and function.

UNIT – III

Antigens: Types, properties, haptanes – adjuvants – vaccines – types –toxoids antitoxins, Immunoglobulins – structure types and properties. Theories of antibody production. complement

UNIT – IV

Antigen – antibody reactions – in vitro methods; Agglutination – Precipitation, Complement fixation, Immunofluoresecence, ELISA, RIA, in vivo methods; Skin tests – immune complex tissue demonstrations.

UNIT – V

Hypersensitivity reactions – antibody mediated, Type I anaphylaxis, Type II – Antibody dependent cell cytotoxicity, Type III – immune complex reactions – respective diseases and immunologic methods of diagnosis – cell mediated immune responses – Lymphokines, Cytokines. Type IV – Hypersensitivity reactions, MHC and transplanation.

Text Book

1. Ivan M.Roit. 1994. Essential Immunology – Blackwell Scientific Publications, Oxford.
2. Donal M.Weir, John, steward, 1993. Immunology VII edition. ELBS, London.
3. Richard M.Hyde 1995. Immunology III edition. National Medical series, Williams and Wilkins. Hardward Publishing company.
4. Jains Kuby 1993, Immunology II edition. W.H.Frumen and Company, New York.

Reference

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
17116DSC56B	Bioinoculants	5	0	0	4

Aim:

- To introduce students to basic characteristics of microorganisms (morphology, cytology, metabolism), their ecologies and importance for life cycles in nature, for plants growing, animal husbandry and processing of plant and animal products.

Objectives

- To give an overview about the role of microorganisms for the cycle of carbon, nitrogen, phosphorus and sulfur in nature with a special focus on agrosystems.
- Importance of microorganisms for agricultural production and commercial composts.

Outcomes

- Students acquire knowledge in microbial preparates, enzymes, and secondary metabolites in agricultural practices.

UNIT – I

General account of the microbes used as biofertilizers for crop plants and their advantages. Symbiotic N2 fixers: Rhizobium- Isolation, characterization, identification, classification, inoculum, production and field application. Frankia- Isolation, characterization-actinorhizal 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 fixing- 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 mycorrhizae Ectomycorrhizae-Endomycorrhizae- Ectendo mycorrhizal- 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). Biotechnology of Biofertilizers, CHIPS, Texas.

Mahendra K. Rai (2005). Hand book of Microbial biofertilizers, The Haworth press, Inc. New York.

Reddy, S. M. et al. (2002). Bioinoculants for sustainable agriculture and forestry, Scientific Publishers.

Subba rao N. S (1995). Soil microorganisms and plant growth. Oxford and IBH publishing co. Pvt. Ltd. New delhi.

Subba rao N. S (1998). Biofertilizers in Agriculture and forestry. Oxford and IBH publishing co. Pvt. Ltd. New delhi.

Skill Based Elective V
PHOTO SHOP

Course Code	Course Title	L	T	P	C	Marks
17120SEC05AL	**Package Lab-V**	**0**	**0**	**2**	**1**	**100**

1. Design a Visiting card.
2. Design a Identity card.
3. Design a letter pad with LOGO.
4. Create an advertisement for News paper and Poster creation.
5. Design a calendar with pictures.
6. Design a Magazine.
7. Create a front page for a Magazine
8. Design a CD Cover.

Course Code	Course Title	L	T	P	C
17160SEC05B	SOFT SKILL V	0	0	2	1

PART -V Leadership Skills and Body Language

UNIT I Leadership Skills

Leaders: their skills, roles, and responsibilities. Vision, Empowering and delegation, motivating others, organizational skills, team building, decision making, giving support, Vision, Mission, Coaching, Mentoring and counseling, Appraisals and feedback, conflict, Power and Politic, Organizing and conducting meetings, Public Speaking

UNIT II Body language

Handshake: Type of Handshake - Posture- Universal Facial Gestures- Eye Contact- Nervous Ticks-reading and analyzing body language, Body language signals and meanings -eyes, mouth, head , arms , hands , handshakes , legs and feet, personal space

Course Code	Course Title	L	T	P	C
17111SEC05L	Communicative English Lab-V	0	0	2	1

Aim:
- To develop communicative skills

Objective:
- To develop vocabulary
- To comprehend meaning from context
- To involve in a dialogue
- To note the important points from the text.
- To write a letter
- To understand the subject verb agreement
- To teach the different genders

Outcome:
- Develop communicative skills

UNIT –1
Correct the spelling mistakes
Comprehension
UNIT –II
Find the odd one out
Picture description
UNIT –III
Abbreviations
Note making
UNIT –IV
Gender
Dialogue writing
UNIT –V
Acronyms
Concord

References:-

A Practical English Grammar -A.J Thomson and A.V.Martinet
English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma

SEMESTER VI

Course Code	Course Title	L	T	P	C
17116AEC61	Industrial Microbiology	4	0	0	5

Aim:

- To train students practically in basic principles of food and industrial microbiology.

Objectives

- It also emphasizes learning about the production of various fermented products and field trips to dairy, food industries, and sewage treatment plants.

Outcomes

- Students acquire hands on training various microbes of industrial importance

UNIT – I

Historical development of Industrial Microbiology, Industrially important microorganisms, Major classes of products and processes. Improvement microbial stains improvement.

UNIT – II

Design of a fermenter, types of fermenters and basic functions. Fermentation media formulation strategies, economical means of providing energy, carbon, nitrogen, vitamin and mineral sources, role of buffers, precursors, inhibitors, inducers and antifoams, types of fermentation.

UNIT – III

The recovery and purification of fermentations products (intracellular and extracellular), cell disruption, precipitation, filtration, centrifugation, solvent recovery, chromatography, ultrafiltration, drying, Cell immobilizations and its applications.

UNIT – IV

Microbial products of pharmaceutical value – raw materials, organism and Industrial processes involved in the production of Penicillin, Vitamin B12 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
17116SEC62	Clinical Microbiology	4	0	0	4

Aim:

- To understand about the pathogenic microbes

Objectives

- To inculcate on the role of normal flora and pathogenic microbes
- To understand the pathogenesis of various diseases
- To understand the various clinical microbiological techniques.

Outcomes

- Get information about various mechanisms of infection
- Knowledge on clinical lab techniques
- Acquire knowledge on control measures of diseases

UNIT – I

Normal microbial flora of the human body, Host-microbe interactions – virulence factors of microbes. Invasiveness and pathogenicity. Non- specific resistance factors.

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.

Course Code	Course Title	L	T	P	C
17116AEC63L	Industrial Microbiology Lab	5	0	0	3

Aim:

- To train students practically in basic principles of food and industrial microbiology.

Objectives

- It also emphasizes learning about the production of various fermented products and field trips to dairy, food industries, and sewage treatment plants.

Outcomes

- Students acquire hands on training various microbes of industrial importance

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
17116SEC64L	Clinical Microbiology Lab	0	0	3	3

Aim:

- To provide technical knowledge on collection and processing of clinical samples

Objectives

- To prepare them to work in clinical laboratory 3. To learn the technique for isolation and identification of pathogens

Outcomes

- Get practical knowledge in specimen collection and processing
- Become technically expert which will helpful to work in clinical laboratory
- Able to identify clinical pathogens

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
17116DSC65A	Microbial Genetics	4	0	0	4

AIM

- The emergence of molecular genetics has revolutionized large areas of modern biological and biochemical research work and 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

History – experiments of Hershey Chase and griffith, DNA as the genetic material – discovery of DNA structure – RNA as a genetic material – Genetic code.

UNIT – II

Organization and functioning of genetic material – Bacterial and viral. Details of E.coli chromosome. Brief account of plasmid – structure – types. Replication of DNA – rolling circle model – theta. Model. Replication of RNA – reverse transcriptase.

UNIT – III

Concept of gene – Lac operon, tryptophan operon, attenuation control – promoters – repressors – gene expression and regulation.

UNIT – IV

Gene transfer mechanisms – conjugation – Transformation – transduction.

UNIT – V

Mutagenesis – mutation – mutants – phenotypic mutants – genotypic mutants – IS elements – transposons – repair mechanism, Carcinogenicity testing.

Text Book

1. Watson JD, Hopkins NH, Roberts JW, Steitz JA, Weiner AM. 1987. Molecular Biology of the Gene. The Benjamin/Cummings publishing company.
2. Lewin B, 1994. Genes – V, Oxford University press.
3. R.S.Old and S.B.Primrose, 1989. Principles of Gene Manipulation, 4th Ed., Blackwell Scientific Publications, London.
4. Lodish, H., Baltimore, D.Berk, A.Zipsury, SL., Matsudaira, P.Darnell, J. 1995. Molecualr Cell Biology. Scientific American Books.e.

Reference

1. Malor Sr, Cronan Jr.JE. Freifelds D 1994. Microbial Genetics. Jones and Bartlett Publishers.
2. Eckstein F, Lilley DM. 1996. Catalytic RNA. Springer – verlag.
3. Friedberg EC, Walker CC. Siede W. 1995. DNA repair and mutagenesis – ASM Press.
4. Gardner EJ, Simmons MJ, Snustad DP. 1991. Principles of Genetics. John Wiley & sons.
5. Singer M, Berg. P. 1991. Genes and Genomes. University Science Books.

Course Code	Course Title	L	T	P	C
17116DSC65B	Bioethics	4	0	0	4

Aim

To understand the basic principles of Bioethics

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 assist 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

General Ethical concerns: the use of nature, Different views of nature, Dynamic nature, interfering with nature, integrity of species; Reducing genetic diversity; Biological warfare; public perception of science.

UNIT – II

Medical ethics; History and culture: The Hippocratic tradition: a profession, Philanthropy, Do no harm, adoption to the oath by western medicine. Competing ethical. Traditions; Retaining the Hippocratic oath.

UNIT – III

Status of Human embryo: Human Embryonic development; Ethics through embryo development: Fertilization, the fetus and feeling pain; Scientific Research on Human Embryos: Experimental goals of Human Embryo Research, Human Development; How much Embryo experimentation in ethical?

UNIT – IV

Animal Rights: Making new strains of animal: Ethical limits of animal use: Religious views of animal status; Philosophical views of animal status; regulations.

UNIT –V

Human Gene therapy: Ethics of somatic cells gene therapy: Efficiency of treatment; safety of transferred genes; protecting human life; Affect on family life; Economic factors; when we should use Gene therapy?

References:

Nancy, S. Jecker., Albert R. Johnson, Robert A. Pearlman. Bioethics: An Introduction to history, methods and practice (1997). Sudbury, M. A, ; Jones and Barlett Publishers.

Tom, L. Beauchamp., childress, F. Principles of biomedical ethics, 5th edition, Oxford University Press. 2000.

Free Elective – Journalism

Course Code	Course Title	L	T	P	C
17111GEC	**UG Free Elective - Journalism**	**4**	**0**	**0**	**2**

Aim :

- To acquaint with the basic knowledge of journalism so that it may enthuse the students to become journalists.

Objective:

- To instill in the minds of students the different aspects of journalism
- To understand the different kinds of news
- To learn the qualities and duties of a reporter, editor and sub editor
- To familiarize with the style and features of the different sections in a newspaper

Outcome:

- Become a journalist

UNIT- I
Journalism – Definition, Qualities of a journalist, Forms of journalism, Role and elements
UNIT- II
News – Definition – Kinds – Elements – Sources
UNIT- III
Reporters
UNIT- IV
The Editor and the Sub Editor
UNIT –V
Language of Journalism, Style
Qualities of a Writer
Writing a News story, Opinion Pieces, Reviews, Headlines, Editorials

References:-

Journalism -Susan
Professional Journalism - John Hogenberg
News Writing and Reporting - M.James Neal (Surjeet Publication)
Professional Journalism -M.V Komath
The Journalist's Handbook -M.V Komath
Mass Communication & Journalism - D.S Mehta

Free Elective – DEVELOPMENT OF MATHEMATICAL SKILLS

Course code	Course Title	L	T	P	C
17112GEC	**Free Elective : Development Of Mathematical Skills**	4	0	0	2

Objectives

Knowledge and understanding are fundamental to studying mathematics and form the base from which to explore concepts and develop problem-solving skills. Through knowledge and understanding students develop mathematical reasoning to make deductions and solve problems. To develop student's ability to apply both conventional and creative techniques to the solution of mathematical problems

Unit I

Simple interest and compound interest

Unit II

Sinking fund – discounting – trade discount – quantity discount – cash discount

Unit III

Set theory – Series

Unit IV

Matrices – Determinants

Unit V

Assignment problems

References

1. P.A.Navanitham, Business Mathematics & Statistics
2. Kanti swarup, P.K.Gupta and Manmohan, " Operations Research"

Learning outcomes

By the end of this course, you should be able to

- know and demonstrate understanding of the concepts from the five branches of mathematics (Operations Research, Set Theory, statistics, Matrices and Business mathematics)
- use appropriate mathematical concepts and skills to solve problems in both familiar and unfamiliar situations including those in real-life contexts
- Select and apply general rules correctly to solve problems including those in real-life contexts.

Free Elective - Instrumentation

Course Code	Course Title	L	T	P	C
17113GEC	**Free Elective** Instrumentation	4	0	0	2

Aim:

Making and analyzing measurements is the primary task of the experimental physicist. This includes designing experiments. Most experimental work, whether in bench-top situations, or using complex instruments. To many physicists this can be as interesting and involving as the basic physics one is trying to do.

Objectives:

The use of instruments is of course not confined to physicists and this kind of experience is valuable in many situations which many students will encounter after graduation.

A good physicist will bring a critical mind aiming to understand not only the result of an investigation but the primary reasons for the behavior of the data.Understand that there are finite limits to our ability to make good measurements, and why.

UNIT – I: Introduction

Potentiometer - calibration of volt meter and ammeter, measurement of resistance, Principles of network theorems – Thevenin's and Norton's theorem – Bridges : AC bridges – Maxwell, Owen, Schering and 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.

Be able to apply Fourier and Laplace transforms to analyse the behaviour and stability of complex systems.

Books for Reference:

1. A course in electrical and electronic measurements and Instrumentation – A.K. Sawhmey – DhanpatRai and Sons – 1990.
2. Electronic measurements and instrumentation – Oliver Cage – McGraw Hill – 1975.

Free Elective - Food and Adulteration

Course Code	**Course Title**	L	T	P	C
17114GEC	**Free Elective** Food and Adulteration	4	0	0	2

Aim: To introduce students to food safety and standardization act and quality control of foods.

Objectives:

1. To educate about common food adulterants and their detection.
2. To impart knowledge in the legislatory aspects of adulteration.
3. To educate about standards and composition of foods and the role of consumers.

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

Free Elective - Web Technology

Course Code	Course Title	L	T	P	C
17120GEC	**Free Elective** Web Technology	4	0	0	2

AIM

To equip the students with basic programming skill in Web Designing

OBJECTIVE

- To understand and practice mark up languages
- To learn Style Sheet and Frames

UNIT I

Introduction to HTML – Head and body sections – Hyper text and Link in HTML documents.

UNIT II

Designing the body section—Managing images in HTML

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms.

OUTCOMES:

- Explore markup languages features and create interactive web pages using them
- Learn and design Client side validation using scripting languages

REFERENCE BOOK

1.World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.

2.Principles of web design – Joel Sklar – Vikas publishing house 2001.

Free Elective – E-COMMERCE AND ITS APPLICATIONS

Course Code	Course Title	L	T	P	C
17122GEC	Free Elective E- Commerce and its Applications	4	0	0	2

AIM:

To organize and promote the exchange of information on communication protocols and information exchange mechanisms for Electronic Commerce.

OBJECTIVES:

To be aware of all aspects of communication and information exchange in Electronic Commerce, including:

- Navigation, brokerage, advertising, and catalogue exchange in pre-sales activities.
- Negotiation and contract making protocols in interactions between consumers, businesses, and public administration.
- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government.

OUTCOMES:

Upon Completion of the course, the students should be able to:

- Secure exchange of documents, content and value in open trading protocols.
- Communication platforms for the e-Economy, including e-commerce, e-business and e-government

UNIT-I:

History of E-commerce and Indian Business Context: Early Business Information Interchange Effort - Emergence of the Internet-Emergence of the world wide web – The milestones – Advantages of E-Commerce- Disadvantages of E-commerce-Online Extension of a BAM model- Transition to E-commerce in India- The internet and India TELCO-Managing Supply chain on the Internet- Hindustan Lever – Getting the E-advantage – Asian paints – E-transforming the organization - CRISIL – Cost – Effective distribution channels – ICICI Bank – Comprehensive Transactions – E-transition challenges for Indian Corporate – The Information Technology Act,2000 – ITC'S echoupal

Business Models for E-Commerce: E-business models based on the Relationship of Transaction parties- E-business model base on the relationship of transaction types.

UNIT-II:

Enabling Technologies of the World Wide Web: Internet client – Server Application – Networks and Internets –Software agents – Internet Service Provider – Broadband Technologies – Hypertext –Java Script - XML

UNIT- III:

E-Marketing: Traditional Marketing – Identifying web presence Goals –The Browsing Behaviour model – online marketing – E-advertising – Internet Marketing Trends – Target Markets – E-branding – Marketing strategies – The Times of India.

UNIT-IV:

E-Security: Information system security-security on the Internet-E-Business risk Management issues-Information security environment in India.

UNIT-V

E-payment Systems: E-Banking at ICICI bank-Main concerns in internet baking-History's lesson about payments: People drive change-digital payment requirements-digital token-based E-payment systems-classification of new payment system-properties of electronic cash(E-cash)-check payment system on the Internet-risk and E-payment system-Designing E-payment system-digital signature-online financial service in India-online stack trading: The high speed alternative.

REFERENCE BOOK:

"E-Commerce: An Indian Perspective" P.T.Joseph, S.J. Third Edition

Free Elective - Indirect Taxes

Course Code	Course Title	L	T	P	C	Marks
17161GEC	Free Elective – Indirect Taxes	4	0	0	2	100

AIM:

To gain knowledge of taxes

OBJECTIVIES:

- **To make the students gain expert knowledge in indirect taxes.**
- **To have practical knowledge on excise duties and customs duties.**
- **To learn the fundamentals of service tax, sales tax and VATS.**

UNIT – I

Objectives of Taxation - contribution to Government revenue- cannons of Taxation – Tax system in India – Direct and Indirect taxes Advantages and
Disadvantages of Indirect taxes.

UNIT – II

Central Excise Duty – Meaning - Levy and collection - Distinction between Excise duty and Customs Duty and Sales Tax. Types of excise duties Methods of Levying Excise Duty – Excise and small scale Industries – Excise and Exports.

UNIT – III

Customs Duty – Levy and collection of customs duty Different types of customs Duties – Prohibition on importation and exportation of goods. Exemptions from customs duty.

UNIT – IV

Service Tax – Growth of Service sector – Meaning of Service Tax – Elements of Service Tax-exempted services from tax - Value of taxable services-Different services on which tax is payable.

UNIT – V

Value Added Tax (VAT)

Meaning of VAT, Justification of VAT – VAT and Sales Tax Advantages and Disadvantages of VAT. Methods of Calculating VAT Levy of VAT and Types of VAT.

Learning Outcome

Students gained knowledge of various provisions of central excise customs law, service tax, VAT and sales tax and their applications in different circumstance**.**

Reference Books:

1. **Income Tax Law and Practice - N.Hariharan.**
2. **Business Taxation – T.S.Reddy/Hari Prasad Reddy.**

SKILL BASED ELECTIVE- VI

FLASH

Course Code	Course Title	L	T	P	C
17120SEC06AL	Package Lab-VI	0	0	2	1

1. Drawing and painting original art in flash.
2. Creating simple objects using flash.
3. Creating a frame-by-frame animation techniques.
4. Develop a program for animation with motion Twenning.
5. Develop a program for animation with shape Twenning.
6. Develop a program for adding sound to your movies.
7. Create a simple Banner.
8. Create a simple animations techniques movie clip and graphic symbols.

Course Code	Course Title	L	T	P	C
17160SEC06B	SOFT SKILL VI	0	0	2	1

PART -VI Life Skills and Other Skills

UNIT I Life Skills

Life Skills - Knows how to use technology to communicate safely and effectively. - Knows how to access community resources in case of emergency. -Knows how to obtain copies of personal documents - knows how to book train ticket, Bus Ticket and Air Ticket. - Occupational Safety , First-aid

UNIT II Other Skills

Other Skills

Meditation. Improving personal memory, Study skills that include Rapid Reading, Notes Taking, Self learning, Complex problem solving and creativity.

Course Code	Course Title	L	T	P	C
17111SEC06L	Communicative English Lab - VI	0	0	2	1

Aim:

- To develop communicative skills

Objective:

- To extract the main ideas from a text
- To understand the meaning of text
- To expand an idea
- To shorten a text
- To develop vocabulary
- To enhance writing skills
- To write simple, compound and complex sentences

Outcome:

- Develop communicative skills

UNIT –I
Jumbled words
Paragraph writing
UNIT –II
Prefix and suffix
Precise writing
UNIT –III
Eponyms
Summarizing
UNIT –IV
Compound words
Simple, Compound and Complex
UNIT –V
Homophones
Essay writing

References:-

A Practical English Grammar -A.J Thomson and A.V.Martinet
English Grammar -Wren and Martin
English Grammar and Composition -Radhakrishna Pillai
Technical Communication -Meenakshi Sharma & Sangeetha Sharma

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M. Sc Microbiology -SYLLABUS – REGULATION 2017
COURSE STRUCTURE

Course Code	Course Title	L	T	P	C
	SEMESTER I				
17216SEC11	Prokaryotic Microbiology	5	0	0	4
17216SEC12	Eukaryotic Microbiology	5	0	0	4
17216SEC13	Microbial Physiology	5	0	0	4
17216SEC14L	Fundamentals of Microbiology Lab	0	0	5	4
17216DSC15_	Discipline Specific Elective	5	0	0	4
17216RLC16	Research Led Seminar	0	0	0	1
	Total	**20**	**0**	**5**	**21**
	SEMESTER II				
17216SEC21	Industrial Microbiology	5	0	0	4
17216SEC22	Environmental and Agricultural Microbiology	5	0	0	4
17216SEC23	Clinical Microbiology	5	0	0	4
17216SEC24L	Industrial, Clinical and Environmental and Agricultural Microbiology Lab	0	0	5	4
17216DSC25_	Discipline Specific Elective II	4	0	0	4
17216RMC26	Research Methodology	3	0	0	3
17216BRC27	Participation in Bounded Research	0	0	0	2
	Total	**22**	**0**	**5**	**25**
	SEMESTER III				
17216SEC31	Microbial Genetics	5	0	0	4
17216SEC32	Molecular Biology and Microbial Biotechnology	5	0	0	4
17216SEC33	Biostatistics and Bioinformatics	5	0	0	4
17216SEC34L	Microbial Biotechnology Lab	4	0	5	4
17216DSC35_	Discipline Specific Elective	0	0	0	3
172_GEC	General Elective	3	0	0	3
17216SRC37	Participation in Scaffold Research (Design/Societal Project)	0	0	0	2
	Total	**22**	**0**	**0**	**24**
	SEMESTER IV				
17216PRW41	Project Work	0	0	30	20
	Total	**0**	**0**	**30**	**20**

Discipline specific Electives

Semester	Discipline specific Elective Courses-I
I	a)17216DSC15A- Immunotechnology b)17216DSC15B- Bioremediation and Waste Management
	Discipline specific Elective Courses-II
II	a)17216DSC25A- Food and Diary Microbiology b)17216 DSC25B- Bioreactor
	Discipline specific Elective Courses-III
III	a)17216DSC35A- Pharmaceutical Microbiology b)17216DSC35B- Genetics and Genetic Engineering

General Electives

Semester	General Elective Courses
III	a) 17211GEC-Writing for the Media b) 17212GEC-Applicable Mathematics Techniques c) 17213GEC-Bio-medical Instrumentation d) 17214GEC-Green Chemistry e) 17220GEC-Internet and Web Design f) 17261GEC- Insurance Services g) 17280GEC-Counselling Psychology

Credit Distribution:

Sem	AEC	SEC	DSC	GEC	Research	Total
I	0	16	4	-	1	21
II	0	16	4	-	5	25
III	0	16	4	2	2	24
IV	-	-	-	-	20	20
Total	**0**	**48**	**12**	**2**	**28**	**90**

Course Code	Course Title	L	T	P	C
17216SEC11	Prokaryotic Microbiology	5	0	0	4

AIM

Prokaryotes are important to all life on earth and play a critical role in the recycling of nutrients by decomposing dead organisms and allowing their nutrients.

OBJECTIVES

- To explore cell structure and morphology in prokaryotes.
- To gain more experience using the microscope.
- To obtain a better understanding of prokaryotes

COURSE OUTCOME

CO1- Scope and historical importance of microbiology

CO2- Understanding the features and classification of prokaryotes.

CO3- study about isolation and identification of microbes

CO4- Economic value of beneficial bacteria

Unit – I

Microbial classification and diversity of microorganisms – classification based on cellularity, cell and kingdom concepts – Whittaker's classification – major group of prokaryotic microorganisms – their characteristics – microbial diversity of viruses, bacterial and cyanobacteria.

Unit – II

Viruses: Introduction – Classification of viruses – cultivation of viruses, purification and assay, various methods of viral assays. Basic structure of viruses – symmetry – biochemical composition of viruses – 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:

1. Text book of Microbiology (2005) by R.C. Dubey, S.Chand & Co., Publishers, New Delhi
2. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Reference

1. Microbiology (1993) Jr. M.J. Peczar, E.C.S. Chan and N.R. Kreig, Mc Graw Hill Inc., NewYork

Course Code	Course Title	L	T	P	C
17216SEC12	Eukaryotic Microbiology	5	0	0	4

AIM

- To describe the basic structures and essential characteristics of eukaryotic cells

OBJECTIVES

- Students will understand the structures and purposes of basic components of eukaryotic cells, especially macromolecules, membranes, and organelles.
- To generate and utilize energy in cells

COURSE OUTCOME

CO1**-** General Features and taxonomy of eukaryotes

CO2- Knowledge about advanced research in mycology, phycology.

CO3- Scope of Algae used as a food

CO4- Economic importance of Lichens and algae

Unit – I

Differentiation of Eukaryotes and Prokaryotes – Salient features of Eukaryotes – Major groups of Eukaryotes – Algae, Fungi, Protozoa and lichens – Classification of Algae, Fungi and Protozoans. Significance of various Algae and fungi in Agricultural Microbiology - Significance of various fungi, algae in environmental biology – biodegradation of Xenobiotics, heavy metals and pesticides, Eukaryotic microbes in Bio pesticides.

Unit – II

Algae: Phycology – Introduction – Distribution of Algae, General features of algae Classification and general characters of prochlorophyta, Rhodophyta, Phaeophyta: Significance of Algae in production.

Unit – III

Biology of Lichens – fungal components and algal component: general characteristics of lichens, physiology of lichens, classification of lichens, Reproduction of lichens, Economic uses of lichens. Single cell protein (SCP) – Spirulina and significance: BGA and significance in agriculture.

Unit – IV

Mycology – Introduction – General characters of Fungi – Structure of fungi – Fungal cell, multiplication of fungi – Fungal diseases of Plants, Animals and Human - Beneficial fungi, VAM – fungi in soil fertility. 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 book:

1. Text book of Microbiology (2005) by R.C. Dubey, S.Chand & Co., Publishers, New Delhi
2. Fundamental of Microbiology (2005) By Purohit, Agrobios Publishers, Meerut

Reference

1. Microbiology (1993) Jr. M.J. Peczar, E.C.S. Chan and N.R. Kreig, Mc Graw Hill Inc., NewYork

Course Code	Course Title	L	T	P	C
17216SEC13	Microbial Physiology	5	0	0	4

AIM:

- Microbial physiology has traditionally played a very important role in both fundamental research and in industrial applications of microorganisms.

OBJECTIVES:

- To understand the major goal of Microbial Physiology and Metabolism is to assist students in rapidly communicating their research and education.
- The overall function is studied through analysis of the cellular response to different environmental conditions.

COURSE OUTCOME (CO'S):

CO1- Understand the factors influencing the growth of microbes in ecosystem

CO2- Learn about Bioluminescence and their advantages.

CO3- Learn about microorganism to assimilate the nutrients for growth.

CO4- Study about metabolic pathway

Unit – I

Cell structure and function: Biosynthesis of peptidoglycan – Outer membrane, teichoic acid 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:

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
17216SEC14L	Fundamentals of Microbiology Lab	0	0	5	4

AIM

- To impart knowledge of the **basic principles** of microbiology

OBJECTIVES

- The goals for this laboratory course is to provide the students with a basic fundamental knowledge of how microorganisms grow, react with specific types of growth media and their biochemical reactions with media used in identification.
- Laboratory procedures are used to show students to learn the vital techniques.

COURSE OUTCOME:

CO1- practical knowledge about isolation and purification of microbes from various sources.

CO2- Training about staining experiments

CO3- Handling on light and compound microscope.

CO4- Learn essential biochemical analysis

1. Principles and methods and sterilization – (Wet, dry and cold sterilization)
2.
3. Direct microscopic observations of bacterial shape – cocci, rods, chains, fungal spores, mycelium, yeast budding.
4.
5. Preparation of Media: Nutrient broth, Nutrient agar, plates, slants, soft agar. Pure culture technique: Streak plate, spread plate and pour plate methods
6.
7. Measurement of size of microbes – micrometry method. Motility determination – Hanging drop method.
8.
9. Isolation and purification of cyanobacteria, actinomycetes, fungi and protozoans.
10.
11. Staining methods: Simple, Negatives, acid fast, Gram staining, Capusule Metachromatic granular staining, Lactophenol cotton blue staining – Fungal slide preparation.
12.
13. Measurement of growth – Direct haemocytometer count, viable count – growth curve,
14.
15. Determination of growth rate and generation time.
16.
17. Effect of pH, temperature and osmotic pressure on growth of bacteria.
18.
19. 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
20. Blood grouping
21. Widal test

22. Total count of RBC
23. Total count of WBC
24. Differential count of WBC
25. Erythrocyte Sedimentation Rate
26. Preparation of Buffer; pH measurement (Tris, phosphate, acetate buffer)

Text Books:

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
17216DSC15A	Immunotechnology	5	0	0	4

AIM:

Immunotechnology is a diverse and growing discipline that can be defined as the study of the tissues, cells and molecules involved in host defense mechanisms

OBJECTIVES:

To understand how the immune system develops, how the body defends itself against disease, and what happens when it all goes wrong.

COURSE OUTCOMES (CO'S):

CO1- Learn scope and history of immunology.

CO2- Study about immune system and lymphatic organs.

CO3- Learn tumor immunology

CO4- gain knowledge about various immunological techniques.

Unit – I

Introduction: History of immunology – types of immunity – Innate and Acquired – Passive and Active - Humoral and cell Mediated Immunity. Lymphoid organs – autoimmunity, physiology of immune response — Immunohaematology

Unit - II

Antigens and Antibodies: Antigens – structure and properties – types – ISO and allo –haptons; adjuvants – antigen specificity, vaccines and toxoids. Immunoglobulins – structure - heterogeneity – types and subtypes – properties (physico – chemical and biological); theories of antibody production - Complement – structure – components - properties and functions of complement components; complement pathways and biological consequences of complement activation

Unit - III

Major Histocompatibility complex: Structure and function of MHC and the HLA system. Gene regulation and 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 Book:

1. Essentials of Clinical Immunology (1986) H.Chapel and Halbey, ELBS
2. Essentials Immunology (1994) M.Rolt Blackwell Scientific Publication, Oxford

Reference:

3. Fundamental Immunology (1998) Paul II Edition, Raver Press NY.

Course Code	Course Title	L	T	P	C
17216DSC15B	Bioremediation and Waste Management	5	0	0	4

AIM

To reduce pollutant levels to undetectable, nontoxic or acceptable levels.

OBJECTIVES:

The bioremediation technology offers the potential to treat contaminated soil and groundwater on-site without the need for excavation and thus, it requires little energy input and preserves the soil structure.

COURSE OUTCOMES:

CO1- Understanding on the management of solid and liquid wastes

CO2- Learn the principles of remedial measures of recycling, reuse and recover from the wastes.

CO3- Understand the mechanism and role of microbes in the degradation of various pollutants

UNIT – I

Wastes– Classification and Quantification – Solid Waste Management and Disposal: Sources and Generation of Solid Waste – characterization, composition and classification. Hazardous Waste Management: Cyanides, Dioxins, Detergents, Plastics, Nylon and Paper. Waste Minimization approaches – Monitoring and Management strategies. Radioactive Waste: Sources, half life of radioactive elements, modes of decay. Effects on Plants, Animal and Man. Low and High-level Radioactive Waste Management – Waste Minimization and Treatment, Radiation standards.

UNIT - II

Recycling of Wastes – Types – sources – composition of waste – recycling of waste for Industrial, Agricultural and Domestic Purposes; Recycling of Metals, Reuse, recovery and reduction of paper and plastics; Recycling in Food Manufacturing, Beverages, Apparel, Leather, Paper, Pulp, Chemical and other industries; Fly Ash utilization. Waste Disposal Methods – composting, incineration, pyrolysis, medical waste disposal strategies.

UNIT – III

Microbial Activity in Soil and Ground Water, Lithosphere as Microbial habitat, Microorganisms in rock and minerals, Mineral soil and Organic soil. Physiological groups of prokaryotes, Geomicrobial transformations – Biodegradation of carbonates – Biomobilization of silicon, phosphate, nitrogen. Geomicrobiology of fossil fuel, methane, peat, coal and petroleum.

UNIT – IV

Principles of Bioremediation – Rapid growth and Metabolism- Genetic plasticity – Metabolic pathways for the degradation of xenobiotics, hydrocarbons – Microbial site characterization – Biodegradation potential – Bioprocess design, optimization – Microbial removal rates – inherent problems associated with biotreatment studies. Microbiological methodologies – Standard biotreatability protocols – Quantification of biodegradation; Biocleaning -Chernobyl radioactive contaminated area - Phytoremediation.

UNIT – V

Aerobic Bioremediation: Bioremediation of Surface Soils: Fate and transport of contaminants in the Vadose zone – Biodegradation in soil ecosystems – Types of soil treatment systems – Bioreactors. Subsurface Aerobic 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.

SEMESTER II

Course Code	Course Title	L	T	P	C
17216SEC21	Industrial Microbiology	5	0	0	4

AIM

To create **industrial** products in mass quantities, often using **microbial** cell factories.

OBJECTIVE

- There are multiple ways to manipulate a microorganism in order to increase maximum product yields.
- To learn complete knowledge on upstream and downstream processing.

COURSE OUTCOME

CO1- Students will get knowledge on strain improvement.

CO2- Enable them to work in fermentation industry.

CO3- Students will get idea on upstream and downstream fermentation process

CO4- Economic importance of Bio products

Unit I

Historical development of industrial microbiology: major classes of products and processes and micro organisms used in industrial processes. Design of a fermenter, types of fermenters and its basic functions

Unit – II

Industrially important microbes and their development: Screening methods for industrial microbes – detection and assay of fermentation products – classification of fermentation types – genetic control of fermentation – strain selection and improvement – Mutation and recombinant DNA techniques for strain development

Unit – III

Fermenter – types and function: Fermenters – Basic functions, design and components – asepsis and 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 – a brief idea on monitoring and control devices and types of fermenters

Continuous culture: System, productivity, product formation. Aeration and agitation, power requirement oxygen transfer kinetics, concepts of Newtonian and Non – Newtonian fluids, plastic fluids apparent viscosity, foam and antifoam. Scale-up, instrumentation control, physical and chemical environment sensors, downstream process

Unit – IV

Large scale fermentation: Fermentation in batch culture: Microbial growth kinetics, measurement of growth (cell number, direct and indirect methods) growth and nutrient, growth and product formation, heat evolution, effect of environment (temperature, pH, high nutrient concentration) media formulation. Sterilization, kinetics of thermal death of micro-organisms, batch and continuous sterilization for fermentation.

Unit –V

Microbial Products: raw materials, organism and industrial process involved in the production of Penicillin, Streptomycin, Ethanol, Acetic acid (Vinegar), Vitamin B_{12} Riboflavin, α- Lysine, Amylase, Protease, Pectinase, Citric acid, Rabies vaccine

Text Books:

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

Reference:

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
8 Venkataraman, L.V. (1983). A monograph on *Spirulina plantensis,* CFTRI, MYSORE
9 Reed, G(1982). Industrial Microbiology. Mac Milliam Publishers Ltd.Wiscosin
10 Ward, O.P. (1989). Fermentation Biotechnology: Principles, Processes and problems prentice Hall engle wood Cliffs Newjersey

Course Code	Course Title	L	T	P	C
17216SEC22	Environmental and Agricultural Microbiology	5	0	0	4

AIM

To address problems in environmental agricultural practices in microbial communities.

OBJECTIVES

- To understand the role of Microbes, especially bacteria, are of great importance in the sense that their symbiotic relationship (either positive or negative) have special effects on the ecosystem.
- To improve soil fertility, such as microbial degradation of organic **matter** and soil nutrient transformations.

COURSE OUTCOME (CO)

CO1- Huge Insights into these precious areas of Environmental microbiology.

CO2- Students able to know detailed idea about biofertilizer production and plant disease**.**

CO3**-** Role ofMicrobes in marine and freshwater environment

CO4- Scope of Recycling of Liquid and Solid wastes

Unit – I

Biogeochemical cycles and Air microbiology: Role of microbes in biogeochemical cycles – carbon, nitrogen, phosphorus, sulphur - Soil microbes and fertility of soil - Air microbiology: a brief account

Unit – II

Aquatic microbiology and bioremediation: Microbes in marine and freshwater environment – eutrophication – quality testing of water – water borne pathogens – Biodegradation and bioaccumulation – bioremediation concepts, microbial and phytoremediation – composting strategy for bioremediation – waste water treatement and methods. Pollution indicators – BOD and COD determination

Unit – III

Soil microbiology: Microbial association – beneficial – nitrogen fixing organism – symbiosis, asymbiosis, associate symbiosis – bacteria actinomycetes, cyanobacteria – mycorrhizae – ecto and endo mycorrhizae – phosphate solubilizers application of biofertilizers in agriculture

Unit – IV

Plant disease and its control: Plant pathogens – bacterial – viral – Fungal pathogens – Morphological, physiological changes with reference to disease establishment in plants and plant protection – phenolics – phytoalexins and related compounds – Bioinsecticides – viral, bacterial and fungal – a brief note

Unit – V

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. Brief account of Ti, Ri plasmids in Biotechnology.

Text Books:

1. Allospe,D., and Scel,K.J(1987) Introduction to Biodeterioration ELBS, London
2. Atals Ronald, M., Bartha, and Richard(1987) Microbial Ecology, 2nd Ed. Benjamin/Cummings Pub., Company, California
3. Dirk, J., Elasas, V., Trevors, J.T., Wellington, EMH(1997). Modern Soil Microbiology, Marcel Dekker INC., New York
4. Ec Eldowney, S., Haedman, DJ., Waite, DJ., Waite S.(1993) Pollution: Ecology and Biotreatment – Longman Scientific Technical

Reference:

5. Grant, W.D. and Long, P.L. (1981) Environment Microbiology. Blackie Glasgow and London
6. Mitchel,R.(1992). Environmental Microbiology, Wiley-John Wiley and Sons, Inc. Publications, New York

Course Code	Course Title	L	T	P	C
17216SEC23	Clinical Microbiology	5	0	0	4

AIM

To introduce basic principles and application the relevance of **clinical** disease.

OBJECTIVE

To learn bacteria, viruses and other pathogens related to infectious diseases in humans.

OUTCOME

CO1-Learn normal flora of the human body.

CO2- Get information about various sources of infection and transmission.

CO3- Epidemiology, pathogenesis and treatment of bacterial, fungal and viral diseases.

CO4- Learn Strategy of antimicrobial therapy.

Unit – I

Normal microbial flora of human – Host – parasite interaction: The Process of infection. Infective syndromes and diagnositic procedure - Strategy of antimicrobial therapy – Epidemiology and control of community infections

Unit – II

Description of the pathogen, pathogenesis, clinical features, laboratory diagnosis and epidemiology of the following diseases

A. Bacteria

Disease	**Pathogen**
a) Pneumonia	*Streptococcus pneumonia*
b) Whooping –cough	*Brodotella pertussis*
c) Meningitis	*Haemophlium influenzae*
d) Diphtheria	*Corynebacterium diphtheriae*
e) Pulmonary Tuberculosis	*Mycobacterium tuberculosis*
f) Leprosy	*Mycobacterium leprae*
g) Typhoid	*Salmonella typhi*
h) Cholera	*Vibrio cholerae*

Unit – III

Description of the pathogen, pathogenesis, clinical features, laboratory diagnosis and epidemiology of the following diseases

Disease	**Pathogen**
i) Tetanus	*Clostridium tetani*
j) Syphillis	*Treponema pallidum*
k) Gonorrhoea	*Neisseria gonorrhoeae*
l) Dental carries	*Streptococcus mutans*
m) Dysentery	*Shigella dysenteriae*
n) Bacterial food poisoning	*Clostridium botulinum*
o) Gastroenteritis	*Escherichia coli*
p) Zoonotic disease and their control	

Unit – IV

B. Virus

Small pox, Influenza, Measles, Poliomyelitis, Common cold(Rhino virus), Hepatitis, Encephalitis, Rabies, AIDS

Unit – V

C. Mycoplasma

Respiratory and Urinogenetal infections

D. Pathogenic Fungi

Superficial, Subcutaneous and systemic mycoses

E. Protozoa:

Amoebiasis – *Entamoeba histolytica*

Malaria – *Plasmodium vivax, P.malariae*

F. Helminthes

Liverfluke – *Fasciola hepatica*

Filariosis – *Wucherichia bancrofti*

G. Hospital acquired infections:

Hospital infections Principles of control – Committee – functions;

Hospital waste disposal – Ethical committee – functions

Text Books:

1 Schachter, M., Med off, G. and Eisenstein, B.C.(1993) mechanism disease, 2nd Edn. Williams and Wilkins Baltimore

2 Smith, C.G.C(1976).Epidemiology and Infections. Medowlealf PressL shildon, England

3 Stokes,J., Ridway, G.L., and Wren, M.W.D.,(1993). Clinical Microbiology 7th Edn. Arnold a division of Hodder and Stoughton.

4 Wistriench, G.A. And lechtonan, M.D.(1988). Microbiology, 5th Edn., Mac publishing company NY

5 Atlas, R.M. (1989) Microbiology – fundamentals and applications 2nd Edn. Maxwell Mac Millan International Edition

Reference:

6 Brovde, A.I(1981). Medical microbiology and infectious diseases. W.B. Saunder's Co., Philadelphia

7 Bryan, L.E.(1987) Antimicrobial drug resistance. Academic Press Inc.Orlands

8 Collee, J.G., Duguid, J.P. , Fraser, A.G., and Marimon, B.P.(1989). Mackie and Mc Cartney Practical Medical Microbiology 13th Edn. Church hill Livingstone.

9 Cruckshank, R., Dugnid, J.P. Marmion, (1973). Medical Microbiology – A guide to the Laboratory diagnosis and control of infections. 12th ed. Vol – I Microbial infections EIBS and Churchill Livingstone, Edinburgh

10 Frankling, T.J. Snow, G.A.(1981). Biochemistry of Antimicrobial action. 3rd Edn. Chapman and Hall NY

11 Tom Parker, M., Leslie H., Collier.(1990) Topley & Wilson's principles of Bacteriology, Virology and Immunity (VIII Edition)

Course Code	Course Title	L	T	P	C
17216SEC24L	Industrial, Clinical and Agricultural Microbiology Lab	0	0	5	4

AIM

To provide technical knowledge on collection and processing of industrial, clinical and environmental samples.

OBJECTIVE

- To test specimens from patients for microorganisms
- To prepare them to work in clinical laboratory.
- To learn the technique for isolation and identification of pathogens.

COURSE OUTCOME

CO1- Get practical knowledge in specimen collection and processing

CO2- Become technically expert which will helpful to work in clinical laboratory

CO3- Learn practical understanding of diagnosis of pathogens.

CO4- Acquire knowledge on fermentation process

CO5- Learn bio fertilizer and inoculants production

Citric acid fermentations by *Aspergillus niger* and quantification
Alcoholic fermentation of fruit juice by yeast (*Saccharomyces cerevisiae).*
Surface and solid state culture of *Beauveria bassiana* and testing mycopesticidal activity
Ethanol production by sung brewer's yeast
Production of citric acid
Immobilization techniques using any microbe
- alginate beads
- polyurethane foam

Hydrolysis of starch
Testing sensitivity of bacteria to antibiotics
Assessing minimum inhibitory concentration of antibiotics
Isolation and identification of certain pathogenic microbes from wound, pus, faeces, sputum, urine
Hemoglobin content of blood
Serum analysis: sugar, cholesterol, serum glutamate oxaloacetate transminase (SGOT), serum glutamic pyruvic transminase(SGPT)
Urine analysis: Albumin, bile, sugars
Preparation of histopathological specimens
Isolation and enumeration of soil microorganisms (fungi, bacteria and actinomycetes)

Isolation and staining of vesicular arbuscular mycorrhizae from plant.

Isolation and culturing of Rhizobium from root nodules of higher plant

Isolation and testing of antagonistic microorganisms from soil (Pythium vs Trichoderma)

Isolation of microorganisms from Rhizsophere and Rhizoplane

Testing nodulation ability of Rhizobium

Seed inoculation with Rhizobium and Testing of nodulation ability

Study of the following disease
: Tobacco mosaic; Bacterial blight of paddy; Downy mildew of bar; Powdery mildew of cucurbits; Head smut of sorghum; Leaf rust of coffee; Leaf spot of mulberry, Red rot of sugar cane, Root knot of mulberry

Isolation and identification of air-borne bio-particles using Andersen sampler

Effects of high salt concentration on microbial growth

Oligodynamic action of heavy metals on bacteria

Microbial flora of polluted water/soil – Microbial flora of sewage

Determintion of BOD of polluted/pond water.
Determination of COD of polluted/pond water.

Microbial degradation of cellulose (cotton) by Chaetomium globosum/any microbe
Bacterial examination of drinking water by membrane filter technique and MPN
Spawn production and mushroom cultivation

Visit to commercial production units – ethanol, acetic acid, vaccine and Spirulina
Visit to CFTRI/DFRL/FOOD INDUSTRUES and report should be written in the practical record

Reference:

1. Clescri,L.S., Greeberg,A.E., and Eaton, A.D.(1998) Standard Methods for Examination of Water and Waste Water, 20th Edition, American Public Health Association
2. Gerhardt,P., Murray R.G., Wood, W.A. and Kreig, N.R.(1994). Methods for General Land Molecular Bacteriology, ASM Publications, Washington
3. Pactricia Cunning(1995) Official Methods of Analysis, Vol I and II, 16th Edition, Arlington, Virginia, USA, AOAL.
4. Richard G., Burus and Howard Slater (1982) Experimental Microbial Ecology, Blackwell Scientific Publishers
5. Tuffery(1996). Laboratory Animal, an Introduction, II Edition, John Wiley and Sons New York

Discipline Specific Elective-II

Course Code	Course Title	L	T	P	C
17216DSC25A	Food and Dairy Microbiology	4	0	0	4

Aim:

- To learn about the epidemiology of foodborne diseases and the pathogens.

Objectives

- To learn about food spoilage factors
- To know the preservation methods
- To make aware of food borne disease

Outcomes

- Better understanding of cause of microbes in food spoilage
- Get information regarding food preservation
- Enable them to work food fermentation industries

Unit – I

Introduction to Food and Dairy Microbiology – Importance of Studying Food and Dairy Microbiology – Primary Sources of micro – organisms in foods. Factors influencing microbial growth in foods extrinsic and intrinsic. Bacterial pathogens such as Brucella, Bacillus, Clostridium, Escherichia, Listeria, Salmonella, Shiegella, Staphylococcus, Vibrio, Yersinia; nematodes: Protozoa, algae, fungi, viruses.

Unit – II

Spoilage of Food: Vegetables, meat, fish, fruits, poultry, prawn and seafood, cereals and egg. Beneficial activities – fermentations – Beer, Vinegar, therapeutic and nutritional value of fermented foods. Microbes as sources of food (Spirulina, Saccharomyces cerevisea, Pleurotes, Rhizopus sp).

Unit – III

Dairy Products: Microflora of milk and milk products, sources of contamination, methods of minimizing contamination, milk-borne infection and intoxication – preservation of milk. Microbiology of fermented milk – starter lactic cultures, buttermilk, cream, yoghurt, kafir, koumiss, acidophilus milk and cheese.

Unit – IV

Food in relation to Diseases: Food borne and water borne infections, sources, symptoms, and prevention – Bacterial toxins and infections: Staphylococus, Bacillus, Clostridium, Escherichia, Salmonella – Fungal toxins and infections: Mycotoxins, Aflotoxins, Mycoses, Aspergillosis, Viral infections – Hepatitis; Protozoan infections – Amoebiasis – methods of detection and detoxification

Unit – V

Food preservation methods and control measures: Physical – irradiation, drying, heat processing, chilling and freezing – Chemical preservatives – Food Sanitation in food manufacture, sanitation of food in retail market and trade, food control agencies and their regulations, quality control, personal hygiene.

Text books:

1. Adams, M.R. and Moss (1995) Food Microbiology. The Royal Society of Chemistry, Cambridge
2. Baumberg.S., Hunter, L.S. and Rhodes, P.M(ed). (1989) Microbial Products – New approaches. Cambridge University Press
3. Biotol(1992) In vitro cultivation of Microorganisms. Butterworth and Heinemann ltd., Oxford
4. Board, R.G. (1983). A modern Introduction to food microbiology. Black well Scientific publications, Oxford
5. Casida,L.E.(1964) Industrial Microbiology, Wiley Eastern Ltd., New Delhi
6. Concon.J.M., (1988) Contaminants and Additives in food Toxicology. Marcel Dekker Inc. New York

Reference:

7. Dasilva, E.T., Dommergues, Y.R., Nyms, E.T. and Rottedge.(1988). Microbial Technology in the Developing World. Oxford University Press
8. Bemain, A.L. and Solomon, N.A., (1986) Manual of Industrial Microbiology and Biochemistry. ASM, Washington
9. Frazier, W.C. and Westhoff D.C. (1978). Food Microbiology. TATA Mc Grew Hill Pub. Company Ltd., New Delhi
10. Ghose, T.K.(1990), Bioprocesses, Computation in Biotechnology. Vol-I Ellis Harwood. New York
11. Hobbs. B.C. and Roberts, D.(1993). Food Poisoning and Food Hygiene. Edward Arnold, London
12. Jay, J.M.(1987). Modern food Microbiology, CBS Pub., And distributors, New Delhi
13. Norris, J.R., and Pettipher, G.L.(1987) Essays in agricultural and food microbiology John Wiley and sons, Singapore
14. Peppler, H.J. and Prelman, D.(1979). Microbial Technology and Fermentation Technology. Vol. I and II Academic Press New York
15. Reed.g(1978). Industrial Microbiology(ed) The AVI Publishing company Inc. Connecticut

Course Code	Course Title	L	T	P	C
17216DSC25B	Bioreactor	4	0	0	4

Aim:

- To train students practically in basic principles of Bioreactor.

Objectives

- It also emphasizes learning about the production of various fermented products and field trips to dairy, food industries, sewage treatment plants.

Outcomes

- Students acquire hands on training various microbes of industrial importance

UNIT-I

Bioreactor / Fermenter – types & operation of Bioreactors, physico-chemical standards used in bioreactors, limitations of bioreactors, stages of fermentation processes, Media design for fermentation processes, Solid substrate fermentation, Fermentors - Air-lift, stirred tank, tower, fluidized bed, packed bed, pulsed, photo bioreactors.

UNIT-II

Principles of Microbial growth – introduction, the ways of growing microorganisms, ways to increase yield of microbes,Batch and Fed-batch bioreactors, Continuous bioreactors, Immobilized cells.Bioreactor operation, Sterilization, Aeration, valves and steam traps, seals, stirrer glands Sensors.

UNIT-III

Industrial production of Ethyl alcohol, Acetic Acid (Vinegar), Citric acid, lactic acid, α-amylase, protease penicillin, tetracycline and vitamin B12, with reference to easily available raw materials, Production of herbal drugs.

UNIT-IV

Downstream processing – extraction, separation, precipitation , filtration, centrifugation, cell disruptions, liquid-liquid extraction, chromatography, recovery & purification, process and quality control.

UNIT-V

Nature of enzymes, application of enzymes, limitations of microbial cells used as catalysts in fermentation, aerobic and anaerobic fermentation, multi-enzyme reactors.

Reference :

1. Fundamentals of Bioanalytical Techniques and Instrumentation, Ghosal and Srivastava, PHI Learning Pvt. Ltd., 2009.
2. Principles of Fermentation technology, Stanbury PF and Whitaker A. Pergamon Press, 1984.
3. Introduction to Biochemical Engineering, D.G.Rao, Tata McGraw Hill Publishers, 2005.
4. Bioprocess Engineering: Basic Concepts, 2nd edition, Shuler,M.L. and Kargi, F., Prentice Hall, Engelwood Cliffs, 2001

5. Molecular Biotechnology: Principles and Applications of Recombinant DNA. Bernard R. Glick and Jack J. Pasternak. ASM Press. 2010. M.Sc. Industrial Biotechnology-2017-18 onwards-UD Annexure No: 83A Page 17 of 39 SCAA Dated:03.07.2017
6. Plants, genes and agriculture by M.J. Chrispeels and D.F. Sadava.2000.The American Scientific Publishers, USA.
7. Biotechnoloical innovations in Animal productivity, BIOTOL Series, Butterworth – Heineman Ltd. Oxford, 1992 REFERENCES 1. Practical Application of Plant Molecular Biology b

Course Code	Course Title	L	T	P	C
17216RMC26	Research Methodology	3	0	0	3

AIM:

To systematically solve a research problem

OBJECTIVES:

- To learn and practice the literature survey aspects of projects and prepare the scope and goal of the proposed project.
- To learn, practice, improve the research presentation skill.

COURSE OUTCOMES:

CO1- Understanding research questions and tools

CO2- Experience in scientific writings

CO3-Practice in various aspects of scientific publications

CO4-Inculcation of research ethics

Unit I –Research

Selection of problem-stages in the execution of research: choosing a topic to publication-preparation of manuscript-report writing- format of journals – proof reading – sources of information: Journals, reviews, books, monographs, etc, 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.

References:-

1. An introduction to practical biochemistry by David T. Plummer.
2. Laboratory Manual in Biochemistry by Pattabiraman and Acharya
3. Practical Biochemistry by J. Jayaraman.
4. Analytical Biochemistry, D. J. Homie and Hazel Peck, Longman group, 3rd edition, 1998.
5. Physical Biochemistry – Application of Biochemistry and Molecular Biology, David Friefelder, W.H Freeman and Co, 2nd Edition 1999.
6. Experimental Biochemistry, Robert Switzer and Liamgarrity, W.H. Freeman and Co, 3rd 1999.
7. Davis, G.B and C.A Parker, 1997. Writing the doctoral dissertation, Barrons Education series, 2nd edition, Pp 160, ISBN: 081208005
8. Duneary, P. 2003. Authoring a Ph. D thesis: how to plan, draft, write and finish a doctoral dissertation. Plagrave Macmillan, Pp256. ISBN 1403905843

SEMESTER III

Course Code	Course Title	L	T	P	C
17216SEC31	Microbial Genetics	5	0	0	4

AIM

- To study the gene transfer from one organism to another.

OBJECTIVE

- To understanding molecular biological studies, the manipulation of eukaryotic organisms, and for practical applications (biotechnology) in diverse areas of life sciences.
- **To** provide relatively simple system for studying **genetic** phenomenon and thus useful to other higher organisms.

COURSE OUTCOME

CO1- Understood genome organization of model organisms.

CO2 - Learn molecular mechanisms that underlie mutations.

CO3- Study about transformation, transduction and conjugation.

CO4- Are able to describe the nature of the transposable elements

Unit I – Nucleic acid as genetic material. Nucleic acids as genetic information carriers: experimental evidence – concept of gene – allele, cistron, replicon – origin of mutation – mutagens – physical and chemical agents. Induced mutation types – mechanisms of mutation induction – suppression of mutations – Intergenic and intragenic suppression. Frame shift mutations – reversion – fine structure mapping – r11 mutants of T4 – fluctuation test.

Unit II – Transformation

Transformation – natural or artificial competence – transformation in Bacillus, E. coli, ***Haemophilus*** and ***Streptococcus*** – mechanism of recombination – genetic mapping.

Unit III – Conjugation

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, Streptomyces***, Plasmids, F-factors description and their uses in genetic analysis. Colicins and col factors.

Unit IV – Transduction

Transduction – generalized and specialized transduction – P1 phage – mechanism of gene transfer through lambda and P1 phages. HFT and LFT lysate. Cotransduction – transduction mapping.

Unit V – Gene regulation

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 corepressors. Negative regulation – ***E. coli*** lac operon; positive regulation – E. coli ara operon; regulation by attenuation – lac and trp operons; antitermination – N protein and nut sites in I. Induction and repression mechanism in operons.

Text Books:
1. Freidberg, E.C., Walker, G.C., Siede, W. (1995). DNA repair and Mutagenesis, ASM Press, Washington, DC.
2. Lewin, B. (2000). Genes VII. Oxford University Press.
3. Maloy, S.R., Cronan, Jr. Je. Freifelder, D. (1998). Microbial genetics, Jones and Barlett Publishers.
4. Malacinski, M. and Freifelder, D. (1998). Essential of Molecular Biology, III Edition, Jone and Barlett Publishers, Boston.
5. Maloy, S.R., Cronan, J.R., Freifelder, D. (1994). Microbial Genetics, Jones and Barlett Publishers.

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
17216SEC32	Molecular Biology and Microbial Biotechnology	5	0	0	4

AIM

To adapt the microbial metabolism, so that the product is produced at maximum theoretical yield, whereas also ATP is produced to support growth and maintenance.

OBJECTIVES
- To develop industrial processes for production of antibiotics, enzymes etc.
- To develop gene surgery and gene therapy to cure genetic disease.
- To create improved varieties of plants and animals through genetic engineering and plant breeding.

COURSE OUTCOME

CO1- Developed an understanding in recombinant DNA technology.

CO2- candidate to recollect the basics of Molecular Genetics and apply cognitive thinking.

CO3-Possibilities ranging from the treatment of human diseases to develop novel medicines

MOLECULAR BIOLOGY:

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. Gene transfer mechanisms-transformation, transduction and conjugation- general process and principles. DNA fingerprinting, Gene expression and Regulation methods. Operon concepts , Lac and trp operons.

MICROBIAL BIOTECHNOLOGY:

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 useful 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. Gene libraries and cDNA cloning. Principles and techniques of Nucleic acid hybridization, protein sequencing and blotting techniques, PCR, DNA fingerprinting. Patent laws and legal protection in Biotechnology.

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. Valuable compounds of microalgae. Production technology of microbial biofertilizers-Azolla, Rhizobium, Azotobacter, Azospirillum and Phosphobacter.

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.
4. Dabnau, D.N.(1982). The molecular Biology of Bacilli Vol-I Bacillus subtilis. Academic Press. NY.
5. David J., Lilley and Eckstein F.(1992). Nucleic acids and Molecular Biology.

Vol 6 Springer-verlag Berlin Heidelberg.
6. Desmond, S.T. and Nicholl (1994). An Introduction to genetic Engineering Cambridge Univ. Press. Cambridge.
6. Friefelder D.(1990) Microbial genetics. Narosa Pub. Home. India.
7. Friedberg, E.C.(1985) DNA Repair. Freeman San Francisco.
8. Gardener E.J.(1991) Principles of Genetics. John Wiley and Sons Inc.NY.

Reference:

9. Hays, W.(1970). The Genetics of Bacteria and their viruses. Studies in Basic genetics and Molecular Biology. II edition. ELBS Blackwell, Oxford.
10. Old R.W. and Primrose S.B.(1989). Principles of Gene Manipulation.IV Edn. Black Well Scientific Pub. London.
11. Sussman, S.C.H., Collins, F.N., Skimmer and Stewartful,D.E.,(1988). The release genetically engineered microorganisms. Academic Press, London.
12. Thomson, T.A., Use of Recombinant DNA. Techniques for improvement of Fermentation organisms. CRC Press. Boca-Raton EL.
13. Hock, J.A.,Chang S.and Ganesan, A.T.(1982). Molecular cloning and gene regulation in Bacilli, Academic Press. NY.
14. Watson,J.D.,Hopkins, N.H., Roberts,J.W., Steitz,J.A. and Weiner A.M(1987) Molecular biology of the gene.4th Edn. The Benjamin cummings Publishing co., Inc.NY.
15. Watson, J.D., Gilman, M.,Witkowshi,J., and Zoller., M.(1992). Recombinant DNA. 2nd Edn. Scientific American Books.

Course Code	Course Title	L	T	P	C
17216SEC33	Biostatistics and Bioinformatics	5	0	0	4

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 – 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.

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.

Course Code	Course Title	L	T	P	C
17216SEC34L	Microbial Biotechnology Lab	4	0	5	4

AIM

To understand the **microbial genes**, genomes, and gene expression and evolution of microorganisms and their interactions with the environment.

OBJECTIVES

- To provide 'hands-on' experience in the investigation and manipulation of microorganisms and their **genes**.
- To develop the ability to think critically and devise **genetic** strategies that might be used to address interesting biological problems.

OUTCOMES

CO1- Has acquired a fairly good knowledge of the tools and the methods for genetic engineering

CO2- Separation of DNA and Protein by gel electrophoresis.

CO3- Students can perform isolation of DNA, amplification of any gene by PCR

CO4- Hands on experience on Molecular genome isolation and identification techniques

MICROBIAL GENETICS

1. Isolation of plasmid DNA from bacteria by Spectrophotometric assay.
2. Isolation of chromosomal DNA from bacteria by Spectrophotometric assay.
3. Development of competent cells in ***E. coli***.
4. Transformation in ***E. coli***.
5. Isolation of antibiotic resistant auxotropic mutants.

MOLECULAR BIOLOGY

1. Restriction digestion of DNA.
2. Separation of proteins using Column chromatographic techniques (Ion exchange, Gel filtration).
3. Protoplast and Spheroplast isolation.
4. Scoring of mutants using Column chromatographic techniques (ion exchange, gel filtration).

MICROBIAL BIOTECHNOLOGY

1. Assay of commercially important compounds – certain vitamins and plant hormones.
2. Immobilization techniques – alginate beads.
3. Estimation of citric acid and ethanol.

DEMONSTRATION

1. Antibiotic resistance – plasmid mediated – chromosomal mediated – Gel Electrophoretic methods.
2. Clonal selection method.
3. Induced Mutagenesis.

Principles and applications of agarose gel electrophoresis and plasmid sepearation in agarose gel.

Discipline Specific Elective III

Course Code	Course Title	L	T	P	C
17216DSC35A	Pharmaceutical Microbiology	0	0	0	3

AIM

To ensure safety and efficacy of **pharmaceutical** products.

OBJECTIVES

To test and ensure sterility, determine effectiveness, contamination or bioburden, analyze toxins (exotoxin or endotoxin) of the drugs.

COURSE OUTCOME

Acquired detailed knowledge of antimicrobial agents, their mechanism of action.

Developed understanding of different types of disinfectants/antiseptics bactericidal and bacteriostatic actions

Regulatory practices, biosensors and applications in Pharmaceuticals.

Quality Assurance and Validation.

Unit – 1 Antibiotics and synthetic antimicrobial agents

Antibiotics and synthetic antimicrobial agents, Antifungal antibiotics, antitumor substances.Peptide antibiotics, Chloramphenicol, Sulphonamides and 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.
2. Analytical Microbiology –Edt by Frederick Kavanagh Volume I & II. Academic Press New York.
3. Quinolinone antimicrobial agents – Edt. by David C. Hooper, John S.Wolfson .ASM Washington DC.
4. Quality control in the Pharmaceutical Industry - Edt. by Murray S.Cooper Vol.2. Academic Press New York.
5. Biotechnology – Edt. by H.J.Rehm & G.Reed, Vol 4. VCH Publications, Federal Republic of Germany.

Course Code	Course Title	L	T	P	C
17216DSC35B	Genetics and Genetic Engineering	0	0	0	3

Aim:

To introduce the molecular basis of Engineering system.

Objectives

- To learn the basic principles of biomolecules.
- To understand the relationships between molecule/cell level phenomena.
- Studying the concepts and mechanism of central dogma.

Outcomes

CO1 - To understand Concept of central dogma of the cell and gene regulation.
CO2 - To know the Principles and applications of various molecular mechanisms.
CO3 - To grasp the significance of Concept of replication, transcription and translation.
CO4 - To understand the process of mutation and its impact

UNIT – I

Overview of genetics: Relation between genes and traits; Mendelian genetics – Three postulates – Dihybrid cross – Test cross – Punnett squax – Trihybrid cross – Pedigree analysis – Linkage – Complete and incomplete linkage – Crossing over – Four strand crossing over – Recombination frequencies – gene mapping in eukaryotes.

Sex determination – sex chromosomes – Klinefilter and Turners syndrome – sex differentiation in humans – Dosage compensation – Barr bodies - sex linked epigenetic inheritance – Gene mutations.

Eugenics – Gene interactions – pleiotropism.

UNIT – II

Population Genetics – gene frequency – gene pool – Hardy Weinberg equilibrium – Allele frequencies – Factors influencing - Human cytogenetics.

Evolutionary genetics – Origin of species – Genetic drift – polymorphism – Natural selection – Genetic code – genetic death – Genetic homeostasis.

UNIT – III

Genetic engineering – overview – Analyzing DNA sequences – Maxam and Gilbert method, chain – terminator method and semi-automated method; southern and northern blotting – methods, merits and limitations; polymerase chain reactions - basic principles, types, special features and applications; cutting and joining DNA molecules – nomenclature, target sites and applications; site-directed mutagenesis – cassette mutagenesis, primer extension and PCR-based mutagenesis.

UNIT – IV

Gene cloning – general strategies – cloning vehicles – plasmids, bacteriophages, cosmids, phasmids and YAC; shuttle and broad host range vectors; recombinant DNA and methods for introducing rDNA into host cells; screening; Expression of Cloned DNA; Cloning in E-coli, bacillus subtilis and saccharomyces cerevisiae – merits and limitations; Gene transfer into plants through Ti plasmids; Transferring genes into animal cells – eggs and embryos.

UNIT – V

Transgenic plants – Insect and herbicide resistant plants; Transfer of Nif genes; Transgenic animals – Animal bioreactors, molecular farming and breeding strategies; Genetic engineering in the production of Insulin, somatostatin, vaccines and antibodies; Gene therapy – types, methods and prevention of diseases; Manipulation of reproduction in animals.

References:

1. Genetics – Strick berger 3rd ed. – Prentice Hall
2. Genetics – Elrod and stansfield – Schaum's outlines – 4th ed. –Tata McGraw Hill.
3. Introduction to genetic analysis – Griffith etal., 8th ed. Freeman.
4. Genetics – Analysis and Principles – Brooker – 2nd ed. McGraw Hill.
5. Concepts of genetics – King and Cummings – 6th ed. – Prentice Hall.
6. Principles of gene manipulation – Old and Primrose.
7. Molecular Biotechnology – Glick and pasternak
8. Genetic engineering of Crop plants – G.W..lycett and D.Grierson.

General Elective

Course Code	Course Title	L	T	P	C
17211GEC	WRITING FOR THE MEDIA	3	0	0	3

Aim:

- To equip students to enter into the realm of mass media.

Objectives:

- To help students to understand the intricacies of mass media
- To know about the barriers to mass communication
- To understand the function of mass media
- To learn the different kinds of news
- To enhance the different kinds of writing for media

Outcome:

- Understand the intricacies of mass media

UNIT-I

Mass communication- Barriers to mass communication and mass culture- Function of mass media - Media effects, Qualities of media men.

UNIT-II

News- Hard and soft news- Expected and unexpected news- Box news- Follow up news-Scoop-Filters- Human interest stories- Recognizing and evaluating news.

UNIT-III

News and views- News analysis, Editorial, Columns, Article, Middle reviews, Letters-Features.

UNIT-IV

Reporting- Crime, Court, Election, Legislature, Sports, Development Investigative, Interpretative depth.

UNIT-V

Writing for Media-Inverted pyramid style-Feature style-TV/Broadcast, New style writing TV/Radio Documentaries- Writing Advertisements-Practical

References-

Journalism -Susan
Professional Journalism -John Hogenberg
News Writing and Reporting -M.James Neal (Surjeet Publication)
Professional Journalism -M.V Komath
The Journalist’s Handbook -M.V Komath
Mass Communication & Journalism -D.S Mehta,

Course Code	Course Title	L	T	P	C
17212GEC	Applicable Mathematics Techniques	3	0	0	3

Aim:

- To acquaint with the basic concept of Interpolation.

Objectives:

- Understand the basic concept of Interpolation.
- To enhance the knowledge about Assignment Problems, Replacement Problems, Decision Analysis and Game Theory.

Outcomes:

- Students using OR techniques in business tools for decision making
- Students develop Assignment problem and Replacement problems
- Understand the concept of decision analysis and game theory
- Students gets the knowledge about interpolation

UNIT I

Interpolation with unequal intervals: Newton's, Lagrage's, and inverse interpolation

UNIT II

Assignment Problems

UNIT III

Replacement Problems

UNIT IV

Decision Analysis

UNIT V

Game Theory

References

1. Unit I, "Numerical Methods in Science and Engineering" M.K.Venkatraman
2. Units II to V, "Operations Research", Kantiswarup, P.K. Gupta and Manmohan

Course Code	Course Title	L	T	P	C
17213GEC	Biomedical Instrumentation	3	0	0	3

AIM:

- To understand the concepts and application of electronic Instrumentation in the Medical field.

OBJECTIVE:

- Understanding basic principles and phenomena in the area of medical diagnostic instrumentation,
- Theoretical and practical preparation enabling students to maintain medical instrumentation

UNIT – I: BIO ELECTRIC 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
17214GEC	**GREEN CHEMISTRY**	3	0	0	3

Aim:

- To reduce the soil and water pollution in the 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 with green chemistry.
  - To learn about the bio-catalytic reactions.
  - To understand about vitamins and antibiotics.

Unit I - Introduction

Introduction-Current status of chemistry and the Environment-Evolution of the Environmental movement: Public awareness - Dilution is the solution to pollutionPollution prevention.

Unit II - Principles

Green Chemistry – Definition – Principles of Green Chemistry - Why is this new area of Chemistry getting to much attention - Why should chemist pursue the Goals of Green Chemistry - The roots of innovation – Limitations.

Unit III - Bio Catalytic Reactions

Green Chemistry Using Bio Catalytic Reactions – Introduction - Fermentation and Bio transformations - Production of Bulk and fine chemicals by microbial fermentationAntibiotics – Vitamins - Bio catalyses synthesis of industrial chemicals by bacterial constructs - Future Tends.

Unit IV - Green House Effect

Green house effect and Global Warming – Introduction - How the green house effect is produced - Major sources of green house gases - Emissions of 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.Tinnesand
2. New Trends in Green Chemistry – V.K.Ahluwalia and M.Kidwai

Course Code	Course Title	L	T	P	C
17222GEC	**Internet and Web Design**	3	0	0	3

Aim

To equip the students with basic programming skill in Web Designing

Objective

- To understand the concepts and architecture of the Worldwide Web.
- To understand and practice mark up languages
- To learn Style Sheet and Frames

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 – Internet Technologies – Internet browsers.

UNIT II

Introduction to HTML – Head and body sections – Designing the body section.

UNIT III

Ordered and unordered lists – Table handling.

UNIT IV

DHTML and Style Sheet – Frames.

UNIT V

A web page design project – Forms.

Reference Book

1.World Wide Web design with HTML – C. Xavier – Tata McGraw – Hill – 2000.
2.Principles of web design – Joel Sklar – Vikas publishing house 2001.

Course Code	Course Title	L	T	P	C
17261GEC	**Insurance Services**	3	0	0	3

Aim:

- To look after the interests of people from uncertainty by providing certainty of compensation.

Objectives:

- To learn the fundamental concepts and principles of insurance.
- To explain the nature of different insurance policies, insurance contracts and settlement of claims.

Out Come:

- The course helped the students to learn the principles of Insurance and the functions of Life and general insurances and the IRDA

UNIT – I

Insurance and Assurance – Importance of Insurance – Functions of Insurance – Insurance contract and their Elements – Fundamental Principles of Insurance contracts

UNIT – II

Types of Insurance contracts – Differences between Life and General Insurance – Concepts in Insurance - Insurer, Insured, Premiums and Claims – Reinsurance – Double Insurance

UNIT – III

Life Insurance – Advantages of Life Insurance – Procedure for Effective Life Insurance – Risk Factors in Life Insurance – Procedure for Settlement of Life Insurance Claims – Different kinds of Life Insurance Policies including Endowment and whole Life Policies.

UNIT – IV

General Insurance – Fire Insurance – Contract of Fire Insurance – Fire Policy Conditions – Subject matter of Fire Insurance – Fire Policy – Marine Insurance – Motor, burglary and Personal Accident Insurance.

UNIT – V

Reforms in Insurance Sector – principles and Types – I.R.D.A., Privatisation of Insurance – Insurance and Employment – Insurance Agents and career Agents – Investments by Insurance companies in housing sector and other infrastructure projects.

Reference Books:

1. Dr.MR.Mishra – Law of Insurance – Central Law Agency Allahabad
2. Dr.M.M.Verma & R.K.Agarwal – Insurance
3. Pandy & Ratogi – Insurance
4. M.N.Mishra & S.Chand - Principles and Practice of Insurance

Course Code	Course Title	L	T	P	C
17280GEC	**Counselling Psychology**	3	0	0	3

Aim:

- To acquaint with counselling and its process

Objectives:

- To learn the fundamental concepts of counselling.
- To know the nature of different determinates.
- To familiarize with the approaches of counselling

Out Come:

- Learn counselling and its process

UNIT I

Definition of Counselling
Counselling as a Solution to Human Problems
Counselling-Expectations & Goals

UNIT II

Personality Determinates, Intellectual Determinates, Emotional Determinates
Social Determinates

UNIT III

Approaches to Counselling
Counselling Process

UNIT IV

Psychological Testing
Diagnosis

UNIT V

Educational Counselling
Family Counselling

References Book:

1. Hanson, J.C. Stevic, R.R., Warner, R.W., Jr. Counselling Theory & Process (2nd Edition) Boston
2. Hurlock Elizabeth B.(2oo7), Human Development, New York, Grawhill Book Company
3. John W, Santrock (1999), Life Span Development, 7th Edition, New Delhi; Mcgrowhill Company
4. Blum And Bolimsky, B. Counselling & Psychology; Bomboy; Asia Publishing House, 1961
5. Bordin, E.S. Psychology Of Counselling New York; Application Century Crafts, 1968
6. Lewis E. C., The Psychology Of Counselling New York Holt, Rinchart And Winston Inc. 1970

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DEPARTMENT OF MICROBIOLOGY

M.PHIL MICROBIOLOGY SYLLABUS - REGULATION 2019

Cross cutting

SEMESTER - I					
COURSE CODE	**COURSE TITLE**	**L**	**T**	**P**	**C**
173_ _ _11 (Common Paper)	Research Methodology	2	2	0	2
173MBC12	Advanced Microbiology	2	2	0	2
173MBC13_	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					
173MBC21	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. Employability/Entrepreneurship/Skill development

References:

- Thesis and Assignment writing by Janarthan Anderson and others – Wiley – Eastern Ltd, 1970. Part I Sections 1,2,3,4. Part II Sections 5,6,9,10.
- Research Methodology by C.R. Kothari, Chapter 1,2,3.
- Microsoft Office 2003 – Edward C. Willet. First Edition 2004, Wiley Publications, USA , (Chapters 2,3,4,5,6,12,14,15,26,28,29)

PAPER II - ADVANCED MICROBIOLOGY

Course Code	Course Title	L	T	P	C
203MBC12	Advanced Microbiology	2	2	0	2

Course Outcome

CO1: To learn about microbial taxonomy and molecular characterization of microbes
CO2: To Learn about applications of microbes in research aspects
CO3: To Gain the knowledge about biotechnological engineering concept in research
CO4: To Learn immune system and its mechanism
CO5: To gain knowledge about nanotechnology and synthesis of nano-particles from microbes.

Unit I:

Prokaryotic and eukaryotic microbial diversity – bacteria, cyanobacteria, microalgae, microfungi, Habitats, nutrition, ultrastructure and mode of reproduction. Isolation, cultivation and preservation of microorganisms. Classification - Haeckel's three kingdom concept. Whittaker's five kingdom concept. Three domine concept of Carl Woese. Classification of bacteria according to Bergey's manual of determinative bacteriology. Criteria for classification and identification of microorganisms – morphological, physiological & biochemical. Numerical taxonomy. Phage typing. Nomenclature – bacteriological code. Introduction - DNA finger printing – RFLP, Plasmid profiles, G+C content. Importance of 16S rRNA in taxonomy & phylogeny.

Unit II:

Basic concepts in medium design – design procedure growth limiting nutrient in designed medium – cell growth and product formation – immobilization and cell culture – cell immobilization – enzyme immobilization. Microbes involved in biodegradation of organic wastes and xenobiotic compounds – heavy metals, pesticides, insecticides. Bioinsecticides – BT toxin. Microbial leaching – Extraction of metals from ores. Biofuels, Microbial hydrogen production. biodegradation of oils and petroleum products.

Unit III:

Diagnostic 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 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 microorganisms 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, modeling of bioreactors, dynamic behavior of bioprocesses, analysis, modeling and simulation of biological networks.

Unit-II

Development of reactors and processes for stabilization of organic and industrial wastes, miniaturisation of bioreaction systems, miniplant technology for integration of biosynthesis and downstream processing, technical and economic assessment of bioproduction processes, application of bioinformatics for development of bioprocesses, biocatalysis for the sustainable synthesis of chemicals and pharmaceuticals from renewable resources, rational engineering of biological systems for sustainable bioprocessing, small mimics, microfluidics and mathematical models for process understanding, scale-translation.

Unit-III

Strain improvement – Applications of mutation, Recombination and DNA Technology.– Principles and applications, enzymology of process. Industrial enzymes production - Proteases, amylases, lipases, cellulases, pectinases, glucose isomerase, L-Asparaginase.

Unit - IV

Kinetics of enzyme reactions, biochemical characterization of enzymes, graphical analysis of kinetic data, pH and temperature dependence, development of recombinant clones for overproduction of enzymes and metabolites, development of expression systems in bacteria and yeasts, bioenergetics and biological molecular machines, protein conformation study and structure-function relationship using biophysical methods, protein engineering by combinatorial methods.

Unit-V

Enzyme engineering and design: substitution, insertion, hybrid proteins, genes for novel enzymes Aequorin and Enviropig, directed evolution and site directed mutagenesis approaches to improve industrial enzymes, engineering more stable enzymes, analysis and design of microbial and enzyme reactors for production of industrially important products such as biofuels, industrial enzymes, biopolymers, etc., development of bio-sensors for detection of various analytes, development of cell culture techniques for cultivation of plant and animal cells in specialized reactors for production of therapeutic compounds. Employability/Entrepreneurship/Skill development

Reference

Yoo YJ et al (2017) Fundamentals of Enzyme Engineering, Springer 2.

Stanbury et al (2003) Principle of Fermentation technology, Butter worth-Heinemann

PAPER IV - RESEARCH AND PUBLICATION ETHICS

Course Code	Course Title	L	T	P	C
CPE_RPE	**Research and publication ethics**				2

THEORY

Unit I: PHILOSOPHY AND ETHICS (3 hours)

1. Introduction to philosophy, definition, nature and scope, concept, 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.