REGULATION
R2022

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NAAC ACCREDITED
THANJAVUR- 613 403 - TAMIL NADU

INDEX

REGULATION - 2022

School: ENGINEERINGAND TECHNOLOGY
Dept: ECE- 22 REGULATION -Mapping of cross cutting issues

ProgrammeName&Code	CourseCode	TitleoftheCourse	Cross cuttingIssues			
			Profession...	GenderSen...	Human...	EnvironmentandSustainability
MTech(FT)ECE22PGCOSFT	22248S11B	AppliedMathematicsforElectronics Engineering	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C12	AdvancedDigitalSignalProcessing	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C13	AdvancedDigitalCommunication Techniques	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C14	OpticalNetworks	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C15	AdvancedRadiationSystems	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271L17	CommunicationSystemsLab–I	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C21	MobileCommunicationNetworks	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C22	AdvancedMicrowaveSystems	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C23	ElectromagneticInterferenceand Compatibility	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271L26	CommunicationSystemsLab– II	-	-	-	-
MTech(FT)ECE22PGCOSFT	222TECWR	TechnicalWriting/Seminars	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271C31	WirelessSensorNetworks	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271P35	Project Phase–I	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271P41	Project Phase–II	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E16A	InternetworkingandMultimedia	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E16B	DigitalImageProcessing	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E16C	LASER Communication	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E24A	HighSpeedSwitchingArchitecture	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E24B	DSPProcessorArchitectureand Programming	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E24C	DigitalSpeechProcessing	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E25A	DigitalCommunicationReceivers	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E25B	SoftComputingTechniques	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E25C	CommunicationNetworkSecurity	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E32A	SoftwareDefined Radio	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E32B	SatelliteCommunication	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E32C	CDMASystems	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E33A	WaveletsandMultiResolution Processing	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E33B	HighPerformanceCommunication Networks	-	-	-	-

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MTech(FT)ECE22PGCOSFT	22271E33C	AdvancedMicroprocessorsand Microcontrollers	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E34A	SpaceTimeWirelessCommunication	-	-	-	-
MTech(FT)ECE22PGCOSFT	22271E34B	MedicalImaging	-	-	✓	-
MTech(FT)ECE22PGCOSFT	22271E34C	MobileADHOCNetworks	-	-	-	-
MTech(PT)ECE22PGCOSFT	22248S11BP	AppliedMathematicsforElectronics Engineering	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C12P	AdvancedDigitalSignalProcessing	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C13P	AdvancedDigitalCommunication Techniques	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271L14P	CommunicationSystemsLab-I	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C21P	MobileCommunicationNetworks	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C22P	AdvancedMicrowaveSystems	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271L24P	CommunicationSystemsLab-II	-	-	-	-
MTech(PT)ECE22PGCOSFT	192TECWRP	TechnicalWriting/Seminars	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C31P	ElectromagneticInterferenceand Compatibility	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C32P	AdvancedRadiationSystems	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C41P	WirelessSensorNetworks	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271C42P	OpticalNetworks	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271P44P	ProjectWork Phase– I	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271P61P	ProjectWorkPhase–II	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E23AP	HighSpeedSwitchingArchitecture	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E23BP	DSPProcessorArchitectureand Programming	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E23CP	DigitalSpeechProcessing	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E33AP	InternetworkingandMultimedia	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E33BP	DigitalImageProcessing	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E33CP	LASER Communication	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E43AP	DigitalCommunicationReceivers	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E43BP	SoftComputingTechniques	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E43CP	CommunicationNetworkSecurity	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E51AP	SoftwareDefined Radio	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E51BP	SatelliteCommunication	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E51CP	CDMASystems	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E52AP	WaveletsandMultiResolution Processing	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E52BP	HighPerformanceCommunication Networks	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E52CP	AdvancedMicroprocessorsand Microcontrollers	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E53AP	SpaceTimeWirelessCommunication	-	-	-	-
MTech(PT)ECE22PGCOSFT	22271E53BP	MedicalImaging	-	-	-	-

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MTech(PT)ECE22PGCOSFT	22271E53CP	MobileADHOCnetworks	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22248S11BP	Applied Mathematics for Electronics Engineering	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C12P	Advanced Digital Signal Processing	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C13P	Advanced Digital Communication Techniques	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271L14P	Communication Systems Lab - I	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C21P	Mobile Communication Networks	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C22P	Advanced Microwave Systems	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271L24P	Communication Systems Lab - II	-	-	-	-
BTECH(PT) ECE 22UGECEPT	222TECWRP	Technical Writing /Seminars	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C31P	Electromagnetic Interference and Compatibility	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C32P	Advanced Radiation Systems	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C41P	Wireless Sensor Networks	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271C42P	Optical Networks	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271P44P	Project Work Phase – I	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271P61P	Project Work Phase – II	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E23AP	High Speed Switching Architecture	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E23BP	DSP Processor Architecture and Programming	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E23CP	Digital Speech Processing	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E33AP	Internetworking and Multimedia	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E33BP	Digital Image Processing	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E33CP	LASER Communication	-	-	-	-

School: ENGINEERINGAND TECHNOLOGY
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BTECH(PT) ECE 22UGECEPT	22271E43AP	Digital Communication Receivers	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E43BP	Soft Computing Techniques	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E43CP	Communication Network Security	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E51AP	Software Defined Radio	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E51BP	Satellite Communication	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E51CP	CDMA Systems	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E52AP	Wavelets and Multi Resolution Processing	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E52BP	High Performance Communication Networks	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E52CP	Advanced Microprocessors and Microcontrollers	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E53AP	Space Time Wireless Communication	-	-	-	-
BTECH(PT) ECE 22UGECEPT	22271E53BP	Medical Imaging	-	-	✓	-
BTECH(PT) ECE 22UGECEPT	22271E53CP	Mobile ADHOC networks	-	-	-	

1.3.1 SUPPORTINGDOCUMENTS

Courses (offered in 2022-23) 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

B.TECH – PART TIME

[REGULATION 2022]

PROGRAMME EDUCATIONAL OBJECTIVES:

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

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

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

PROGRAMME OUTCOMES:

Engineering Graduates will be able to:

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

B. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

C. **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

D. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

E. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

F. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

G. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

J. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

K. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

L. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

MAPPING OF PROGRAMME EDUCATIONAL OBJECTIVES WITH PROGRAMME OUTCOMES

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

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

Contribution 1: Reasonable 2: Significant 3: Strong

B.TECH (PART TIME) – ECE – R-2022

SEMESTER I – VII CURRICULUM

SEMESTER-I

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	22148S11P	Transforms and Partial Differential Equations	**3**	**1**	**0**	**4**
2	22152C12P	Electromagnetic Fields	**3**	**1**	**0**	**4**
3	22152C13P	Digital Electronics	**3**	**1**	**0**	**4**
4	22152C14P	Electronic Circuits - I	**3**	**0**	**0**	**3**
5	22152C15P	Signals and Systems	**4**	**0**	**0**	**4**
TOTAL CREDITS						**19**

SEMESTER-II

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	22148S21BP	Probability and Random Processes	**3**	**1**	**0**	**4**
2	22152C22P	Communication Theory	**3**	**0**	**0**	**3**
3	22152C23P	Linear Integrated Circuits	**3**	**1**	**0**	**4**
4	22152C24P	Electronic Circuits – II	**3**	**1**	**0**	**4**
5	22152C25P	Transmission Lines and Waveguides	**4**	**0**	**0**	**4**
TOTAL CREDITS						**19**

SEMESTER-III

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1.	22148S31BP	Numerical Methods	**3**	**1**	**0**	**4**
2.	22152C32P	Microprocessor and Microcontrollers	**3**	**1**	**0**	**4**
3.	22152C33P	Digital Signal Processing	**3**	**1**	**0**	**4**
4.	22152C34P	Digital Communication	**3**	**1**	**0**	**4**
5.	22152L35P	Microprocessor and Microcontrollers Lab	**0**	**0**	**3**	**2**
TOTAL CREDITS						**18**

SEMESTER-IV

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	22152C41P	Medical Electronics	3	1	0	4
2	22152C42P	Antenna and Wave Propagation	3	1	0	4
3	22152C43P	Computer Networks	4	0	0	4
4	22152E44_P	**Elective-I**	4	0	0	4
5	22152L45P	Networks and Communication Lab	0	0	3	2
					TOTAL CREDITS	18

SEMESTER-V

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	22152C51P	Optical Communication and Networks	4	0	0	4
2	22152C52P	Microwave Engineering	4	0	0	4
3	21160C53P	Principles of Management	3	1	0	4
4	22152E54_P	**Elective II**	4	0	0	4
5	22152L55P	Optical Communication and Microwave Lab	0	0	3	2
					TOTAL CREDITS	18

SEMESTER-VI

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	22152C61P	Wireless Communication	4	0	0	4
2	22152C62P	VLSI Design	3	1	0	4
3	22152C63P	Embedded and Real Time Systems	3	1	0	4
4	22152E64_P	**Elective III**	4	0	0	4
5	22152L65P	VLSI and Embedded Systems Lab	0	0	3	2
					TOTAL CREDITS	18

SEMESTER-VII

S.NO	SUB CODE	SUBJECT NAME	Periods Per Week			C
			L	T	P	
1	21160S71P	Total Quality Management	**3**	**0**	**0**	**3**
2	22152C72P	Wireless Networks	**3**	**1**	**0**	**4**
3	22152C73P	Telecommunication Switching and Networks	**4**	**0**	**0**	**4**
4	22152E74_P	**Elective IV**	**3**	**0**	**0**	**3**
5	22152P75P	Project Work	**0**	**0**	**12**	**6**
TOTAL CREDITS						**20**

LIST OF ELECTIVES

ELECTIVE-I (SEMESTER-IV)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	22152E44AP	High Speed Networks	**4**	**0**	**0**	**4**
2	22152E44BP	Advanced Digital Signal Processing	**4**	**0**	**0**	**4**
3	22152E44CP	Speech Processing	**4**	**0**	**0**	**4**
4	22152E44DP	Fuzzy Logic and Neural Networks	**4**	**0**	**0**	**4**
5	22152E44EP	Advanced Electronic System Design	**4**	**0**	**0**	**4**

ELECTIVE-II (SEMESTER-V)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	22152E54AP	Environmental Science and Engineering	**4**	**0**	**0**	**4**
2	22152E54BP	Optoelectronic Devices	**4**	**0**	**0**	**4**
3	22152E54CP	Radar and Navigational Aids	**4**	**0**	**0**	**4**
4	22152E54DP	Digital Image Processing	**4**	**0**	**0**	**4**
5.	22152E54EP	Engineering Acoustics	**4**	**0**	**0**	**4**

ELECTIVE-III (SEMESTER-VI)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	22152E64AP	Professional Ethics in Engineering	**4**	**0**	**0**	**4**
2	22152E64BP	Satellite Communication	**4**	**0**	**0**	**4**
3	22152E64CP	Robotics and Automation	**4**	**0**	**0**	**4**
4	22152E64DP	Remote sensing	**4**	**0**	**0**	**4**
5.	22152E64EP	Network Security	**4**	**0**	**0**	**4**

ELECTIVE-IV (SEMESTER-VII)

S.No	Sub Code	Sub Name	Periods Per Week			C
			L	T	P	
1	22152E74AP	Power Electronics	**3**	**0**	**0**	**3**
2	22152E74BP	Advanced Microprocessors and Microcontrollers	**3**	**0**	**0**	**3**
3	22152E74CP	Electromagnetic Interference and Compatibility	**3**	**0**	**0**	**3**
4	22152E74DP	Solid State Electronic Drives	**3**	**0**	**0**	**3**
5	22152E74EP	Computer Hardware and Interfacing	**3**	**0**	**0**	**3**

B.TECH (PART TIME) – ECE – R-2022

COURSE STRUCTURE AND CREDITS DISTRIBUTION

Sem.	Core Courses				Elective Courses		Total Credits
	Theory Courses		Practical Courses				
	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	05	19	-	-	-	-	19
II	05	19	-	-	-	-	19
III	04	16	01	02	-	-	18
IV	03	12	01	02	01	04	18
V	03	12	01	02	01	04	18
VI	03	12	01	02	01	04	18
VII	03	11	01	06	01	03	20
Total Credits							130

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

21148S11P **SEMESTER I**

TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS **3 1 0 4**

(Common to CSE, IT, ECE)

AIM

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

OBJECTIVES

At the end of the course the students would

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

UNIT I FOURIER SERIES 9

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

22152C12P **SEMESTER I**

ELECTROMAGNETIC FIELDS **3 1 0 4**

AIM

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

OBJECTIVES

- To impart knowledge on the basics of static electric and magnetic field and the associated laws.
- To give insight into the propagation of EM waves and also to introduce the methods in computational electromagnetics.
- To make students have depth understanding of antennas, electronic devices, Waveguides is possible.

UNIT I STATIC ELECTRIC FIELD 9

Vector Algebra, Coordinate Systems, Vector differential operator, Gradient, Divergence, Curl, Divergence theorem, Stokes theorem, Coulombs law, Electric field intensity, Point, Line, Surface and Volume charge distributions, Electric flux density, Gauss law and its applications, Gauss divergence theorem, Absolute Electric potential, Potential difference, Calculation of potential differences for different configurations. Electric dipole, Electrostatic Energy and Energy density.

UNIT II CONDUCTORS AND DIELECTRICS 9

Conductors and dielectrics in Static Electric Field, Current and current density, Continuity equation, Polarization, Boundary conditions, Method of images, Resistance of a conductor, Capacitance, Parallel plate, Coaxial and Spherical capacitors, Boundary conditions for perfect dielectric materials, Poisson‟s equation, Laplace's equation, Solution of Laplace equation, Application of Poisson‟s and Laplace‟s equations.

UNIT III STATIC MAGNETIC FIELDS 9

Biot -Savart Law, Magnetic field Intensity, Estimation of Magnetic field Intensity for straight and circular conductors, Ampere‟s Circuital Law, Point form of Ampere‟s Circuital Law, Stokes theorem, Magnetic flux and magnetic flux density, The Scalar and Vector Magnetic potentials, Derivation of Steady magnetic field Laws.

UNIT IV MAGNETIC FORCES AND MATERIALS 9

Force on a moving charge, Force on a differential current element, Force between current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and permeability, Magnetic boundary conditions involving magnetic fields, The magnetic circuit, Potential energy and forces on magnetic materials, Inductance, Basic expressions for self and mutual inductances, Inductance evaluation for solenoid, toroid, coaxial cables and transmission lines, Energy stored in Magnetic fields.

UNIT V TIME VARYING FIELDS AND MAXWELL'S EQUATIONS 9

Fundamental relations for Electrostatic and Magnetostatic fields, Faraday‟s law for Electromagnetic induction, Transformers, Motional Electromotive forces, Differential form of Maxwell‟s equations, Integral form of Maxwell‟s equations, Potential functions, Electromagnetic boundary conditions, Wave equations and their solutions, Poynting‟s theorem, Time harmonic fields, Electromagnetic Spectrum.

TUTORIAL 15 **TOTAL : 60**

TEXTBOOKS

1. William H Hayt and Jr John A Buck, "Engineering Electromagnetics", Tata Mc Graw-Hill Publishing Company Ltd, New Delhi, 2008
2. Sadiku MH, "Principles of Electromagnetics", Oxford University Press Inc, New Delhi, 2009

REFERENCES

1. David K Cheng, "Field and Wave Electromagnetics", Pearson Education Inc, Delhi, 2004
2. John D Kraus and Daniel A Fleisch, "Electromagnetics with Applications", Mc Graw Hill Book Co, 2005
3. Karl E Longman and Sava V Savov, "Fundamentals of Electromagnetics", Prentice Hall of India, New Delhi, 2006
4. Ashutosh Pramanic, "Electromagnetism", Prentice Hall of India , New Delhi, 2006

DIGITAL ELECTRONICS **3 1 0 4**

AIM

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

OBJECTIVES

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

UNIT I: BOOLEAN ALGEBRA AND MINIMIZATION 9

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

UNIT II: DIGITAL LOGIC FAMILIES 9

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

UNIT III: COMBINATIONAL LOGIC DESIGN 9

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

UNIT IV: SEQUENTIAL LOGIC DESIGN 9

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

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.

22152C14P **SEMESTER I**

ELECTRONIC CIRCUITS –I **3 0 0 3**

AIM

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

OBJECTIVE

On completion of this course the student will understand

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

UNIT – I 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

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

TUTORIAL 15 TOTAL : 60

TEXT BOOK

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

REFERENCE BOOKS

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

22152C15P **SEMESTER I**

SIGNALS AND SYSTEMS **4 0 0 4**

(Common to ECE & IT)

AIM

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

OBJECTIVES

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

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

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

UNIT II ANALYSIS OF CT SIGNALS 9

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

UNIT III LTI-CT SYSTEMS 9

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

UNIT IV SAMPLING THEOREM AND ANALYSIS OF DT- SIGNALS 9

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

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

UNIT V LTI-DT SYSTEMS 9

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

TUTORIAL 15 **TOTAL : 60**

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

21148S21BP **SEMESTER II**

PROBABILITY AND RANDOM PROCESSES

3 1 0 4

AIM

This course aims at providing the necessary basic concepts in random processes. A knowledge of fundamentals and applications of phenomena will greatly help in the understanding of topics such 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).

22152C22P **SEMESTER II**

COMMUNICATION THEORY 3 1 0 4

AIM

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

OBJECTIVE

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

UNIT 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.

22152C23P **SEMESTER II**

LINEAR INTEGRATED CIRCUITS **3 1 0 4**

AIM

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

OBJECTIVES

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

UNIT I OP AMP CHARACTERISTICS AND APPLICATIONS 9

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

UNIT II COMPARATORS AND SIGNAL GENERATORS 9

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

UNIT III ANALOG MULTIPLIER AND PLL 9

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

UNIT IV ADC AND DAC 9

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

UNIT V SPECIAL FUNCTION ICS 9

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

TUTORIAL 15 TOTAL : 60

TEXT BOOK

1. Sergio Franco, 'Design with operational amplifiers and analog integrated circuits', McGraw-Hill, 1997.
2. D.Roy Choudhry, Shail Jain, "Linear Integrated Circuits", New Age International Pvt. Ltd., 2000.

REFERENCES

1. J.Michael Jacob, 'Applications and Design with Analog Integrated Circuits', Prentice Hall of India, 2196.
2. Ramakant A.Gayakwad, 'OP-AMP and Linear IC's', Prentice Hall / Pearson Education, 1994.
3. K.R.Botkar, 'Integrated Circuits'. Khanna Publishers, 1996.
4. Millman.J. and Halkias.C.C. 'Integrated Electronics', McGraw-Hill, 1972.
5. William D.Stanely, 'Operational Amplifiers with Linear Integrated Circuits' Pearson Education, 2004.

22152C24P **SEMESTER II**

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

AIM

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

OBJECTIVES

On completion of this course the student will understand

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

UNIT I : POWER AMPLIFIERS **9**

Classification, Efficiency of Class A , RC coupled, Transformer coupled, Class B push pull, Complementary symmetry power amplifier, Power Output, Efficiency and Power Dissipation, cross over 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 ", McGraw Hill International.
4. 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 0 0 4**

AIM

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

OBJECTIVES

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

UNIT I TRANSMISSION LINE THEORY 9

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

22148S31BP **SEMESTER III**

NUMERICAL METHODS **3 1 0 4**

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.

22152C32P **SEMESTER III**

MICROPROCESSORS AND MICROCONTROLLERS

3 1 0 4

OBJECTIVES:

The student should be made to:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

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 – IO 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.

TUTORIAL: 15 Hrs **TOTAL: 45 PERIODS**

OUTCOMES:

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

- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.

- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

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.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education, 2011.

REFERENCE:

1. Doughlas V.Hall, “Microprocessors and Interfacing, Programming and Hardware”,TMH,2012

22152C33P **SEMESTER III**

DIGITAL SIGNAL PROCESSING 3 1 0 4

AIM

To study the signal processing methods and processors.

OBJECTIVES

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

UNIT I FAST FOURIER TRANSFORM 9

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

UNIT II IIR FILTER DESIGN 9

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

UNIT III FIR FILTER DESIGN 9

Symmetric & 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.

22152C34P **SEMESTER III**

DIGITAL COMMUNICATION **3 1 0 4**

AIM

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

OBJECTIVES

- To 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 SAMPLING & QUANTIZATION 9

Low pass sampling – Aliasing- Signal Reconstruction-Quantization - Uniform & non-uniform quantization - quantization noise - Logarithmic Companding of speech signal- PCM - TDM

UNIT II WAVEFORM CODING 9

Prediction filtering and DPCM - Delta Modulation - ADPCM & ADM principles-Linear Predictive Coding

UNIT III BASEBAND TRANSMISSION 9

Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ - Manchester- ISI – Nyquist criterion for distortionless transmission – Pulse shaping – Correlative coding - Mary schemes – Eye pattern - 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 - Vitterbi Decoder

TUTORIAL 15 **TOTAL: 60**

Textbook:

1. S. Haykin, “Digital Communications”, John Wiley, 2005.

Reference:

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.

22152L35P SEMESTER III

L T P C
0 0 3 2

MICROPROCESSOR AND MICROCONTROLLER LABORATORY

OBJECTIVES:

The student should be made to:

- Introduce ALP concepts and features
- 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 control
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: 45 PERIODS

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

- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator

22152C41P **SEMESTER IV**

MEDICAL ELECTRONICS **3 1 0 4**

AIM

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

OBJECTIVE

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

UNIT I ELECTRO– PHYSIOLOGY AND BIO– POTENTIAL RECORDING 9

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

UNIT II BIO– CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

PH – 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.

22152C42P **SEMESTER IV**

ANTENNA AND WAVE PROPAGATION **3 1 0 4**

AIM

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

OBJECTIVES

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

UNIT I : RADIATION 9

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

UNIT II: ANTENNA 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 – 2nd edition 2003.

22152C43P **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 DATA LINK LAYER 12

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

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

UNIT III NETWORK LAYER 10

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

UNIT IV TRANSPORT LAYER 8

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

UNIT V APPLICATION LAYER 7

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

TOTAL : 45

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.

22152L45P **SEMESTER IV**

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

22152E44AP **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

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

22152E44BP **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.

ELECTIVE - I

22152E44CP **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 Vertag, 1972.
2. Witten I.H., “Principles of Computer Speech”, Academic Press, 1983.

ELECTIVE - I

22152E44DP **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

ELECTIVE - I

22152E44EP **SEMESTER IV**

ADVANCED ELECTRONIC SYSTEM DESIGN 4 0 0 4

AIM

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

OBJECTIVE

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

UNIT I: INTRODUCTION TO RF DESIGN 9

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

UNIT II: RF TRANSISTOR AMPLIFIER DESIGN 9

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

UNIT III: DESIGN OF POWER SUPPLIES 9

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

UNIT IV: DESIGN OF DATA ACQUISITION SYSTEMS 9

Amplification of low level signals – Grounding – Shielding and guarding techniques – Dual slope – Quad slope and high speed A/D converters – Microprocessors compatible

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",

22152C51P **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.

22152C52P **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:

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

21160C53P **SEMESTER V**

PRINCIPLES OF MANAGEMENT

4 0 0 4

UNIT I - Nature of Management **9**

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

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

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

UNIT III - Planning and organizing **9**

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

UNIT IV - Direction and Coordination **9**

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

UNIT V – Controlling **9**

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

TOTAL : 45

Textbooks:

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

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

22152L55P **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

22152E54AP **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.
2. BharuchaErach, " The Biodiversity of India ," Mapin Publishing Pvt,Ltd.

ELECTIVE- II

22152E54BP **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.

22152E54CP **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

ELECTIVE- II

22152E54DP **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:

2. 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

ELECTIVE- II

22152E54EP **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 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

1. 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.

22152C61P **SEMESTER VI**

WIRELESS COMMUNICATION **4 0 0 4**

Objectives

- Know the characteristic of wireless channel
- Learn the various cellular architectures
- Understand the concepts behind various digital signaling schemes for fading channels
- Be familiar the various multipath mitigation techniques
- Understand the various multiple antenna systems

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 Macrodiversity, 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

TEXT BOOKS:

1. Rappaport,T.S., “Wireless communications”, Second Edition, Pearson Education, 2010.
2. Andreas.F. Molisch, “Wireless Communications”, John Wiley – India, 2006.

REFERENCES:

1. David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
2. Upena Dalal, “ Wireless Communication”, Oxford University Press, 2009.
3. Van Nee, R. and Ramji Prasad, “OFDM for wireless multimedia communications”, Artech House, 2000.

22152C62P SEMESTER VI

VLSI DESIGN **3 1 0 4**

AIM

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

OBJECTIVES

- In this course, the MOS circuit realization of the various building blocks that is common to any microprocessor or digital VLSI circuit is studied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in CMOS technology are discussed.
- The main focus in this course is on the transistor circuit level design and realization for digital operation and the issues involved as well as the topics covered are quite distinct from those encountered in courses on CMOS Analog IC design.

UNIT I MOS TRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical properties of CMOS circuits and device modeling, Scaling principles and fundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNIT II COMBINATIONAL LOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore‟s constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNIT III SEQUENTIAL LOGIC CIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNIT IV DESIGNING ARITHMETIC BUILDING BLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrel shifters, speed and area tradeoff

UNIT V IMPLEMENTATION STRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TUTORIAL 15 **TOTAL : 60**

TEXTBOOKS:

1. Jan Rabaey, Anantha Chandrakasan, B.Nikolic, “Digital Integrated Circuits: A Design Perspective”, Second Edition, Prentice Hall of India, 2003.
2. M.J. Smith, “Application Specific Integrated Circuits”, Addisson Wesley, 1997

REFERENCES:

1. N.Weste, K.Eshraghian, “Principles of CMOS VLSI Design”, Second Edition, Addision Wesley 1993
3. R.Jacob Baker, Harry W.LI., David E.Boyee, “CMOS Circuit Design, Layout and Simulation”, Prentice Hall of India 2005
4. A.Pucknell, Kamran Eshraghian, “BASIC VLSI Design”, Third Edition, Prentice Hall of India, 2007.

22152C63P **SEMESTER VI**

3 1 0 4

EMBEDDED AND REAL TIME SYSTEMS

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.

Tutorial: 15 Hrs 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.

22152L65P **SEMESTER VI**

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

22152E64AP **SEMESTER VI**

PROFESSIONAL ETHICS IN ENGINEERING 4 0 0 4

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:

- 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 Mc Graw 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.
3. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – 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 Engineers”, Oxford University Press, Oxford, 2001
6. 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.
7. World Community Service Centre, “Value Education”, Vethathiri publications, Erode, 2011

Web sources:

www.onlineethics.org
www.nspe.org
www.globalethics.org
www.ethics.org

ELECTIVE -III

22152E64BP **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

ELECTIVE -III

22152E64CP **SEMESTER VI**

ROBOTICS AND AUTOMATION **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

- To study the various parts of robots and fields of robotics.
- To study the various kinematics and inverse kinematics of robots.
- To study the Euler, Lagrangian formulation of Robot dynamics.
- To study the trajectory planning for robot.
- To study the control of robots for some specific applications.

UNIT I BASIC CONCEPTS 9

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Asimov‟s laws of robotics – dynamic stabilization of robots.

UNIT II POWER SOURCES AND SENSORS 9

Hydraulic, pneumatic and electric drives – determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging – laser – acoustic – magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS 9

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

UNIT IV KINEMATICS AND PATH PLANNING 9

Solution of inverse kinematics problem – multiple solution jacobian work envelop – hill Climbing Techniques – robot programming languages

UNIT V CASE STUDIES 9

Mutiple robots – machine interface – robots in manufacturing and non- manufacturing applications – robot cell design – selection of robot.

Total: 45

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., "Industrial Robotics", Mc Graw-Hill Singapore, 1996.
2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCES:

1. Deb. S.R.,“Robotics Technology and flexible Automation”, John Wiley, USA 1992.

2. 2.Klafter R.D., Chimielewski T.A., Negin M., “Robotic Engineering – An integrated approach”, Prentice Hall of India, New Delhi, 1994.

3. Mc Kerrow P.J. “Introduction to Robotics”, Addison Wesley, USA, 1991.

4. Issac Asimov “Robot”, Ballantine Books, New York, 1986.

5. Barry Leatham - Jones, "Elements of industrial Robotics" PITMAN Publishing, 1987.

6. Mikell P.Groover, Mitchell Weiss, Roger N.Nagel Nicholas G.Odrey, "Industrial Robotics Technology, Programming and Applications ", McGraw Hill Book Company 1986.

7. Fu K.S. Gonzaleaz R.C. and Lee C.S.G., "Robotics Control Sensing, Vision and Intelligence" McGraw Hill International Editions, 1987.

ELECTIVE -III

22152E64DP **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:

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

ELECTIVE -III

22150E64EP **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.

TOTAL QUALITY MANAGEMENT 3 0 0 3

OBJECTIVE

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

1. INTRODUCTION 9

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

2. TQM PRINCIPLES 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, 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

WIRELESS NETWORKS 3 1 0 4

OBJECTIVES

- To study about Wireless networks, protocol stack and standards.
- To study about fundamentals of 3G Services, its protocols and applications.
- To study about evolution of 4G Networks, its architecture and applications.

UNIT I WIRELESS LAN 9

Introduction-WLAN technologies: Infrared, UHF narrowband, spread spectrum - IEEE802.11: System architecture, protocol architecture, physical layer, MAC layer, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth: Architecture, Radio Layer, Baseband layer, Link manager Protocol, security - IEEE802.16-WIMAX: Physical layer, MAC, Spectrum allocation for WIMAX

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, Dynamic source routing

UNIT III MOBILE TRANSPORT LAYER 9

TCP enhancements for wireless protocols - Traditional TCP: Congestion control, fast retransmit/fast recovery, Implications of mobility - Classical TCP improvements: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, Transaction oriented TCP - TCP over 3G wireless networks.

UNIT IV WIRELESS WIDE AREA NETWORK 9

Overview of UTMS Terrestrial Radio access network-UMTS Core network Architecture: 3G-MSC, 3G-SGSN, 3G-GGSN, SMS-GMSC/SMS-IWMSC, Firewall, DNS/DHCP-High speed Downlink packet access (HSDPA)- LTE network architecture and protocol.

UNIT V 4G NETWORKS 9

Introduction – 4G vision – 4G features and challenges - Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, OFDM-MIMO systems, Adaptive Modulation and coding with time slot scheduler, Cognitive Radio.

TOTAL : 45

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

TELECOMMUNICATION SWITCHING AND NETWORKS

4 0 0 4

AIM

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

OBJECTIVES

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

UNIT I EVOLUTION OF TELECOMMUNICATION SWITCHING AND CIRCUITS 9

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

UNIT II ELECTRONIC SWITCHING 9

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

UNIT III TELECOMMUNICATION SIGNALLING AND TRAFFIC 9

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

UNIT IV INTEGRATED DIGITAL NETWORKS 9

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

UNIT V DATA NET WORKS 9

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

TOTAL : 45

TEXT BOOKS:

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

REFERENCES

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

ELECTIVE – IV

22152E74AP **SEMESTER VII**

POWER ELECTRONICS 3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I POWER SEMICONDUCTOR DEVICES 9

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

UNIT II POWER SUPPLIES 9

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

UNIT III INVERTERS 9

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

UNIT IV CHOPPERS 9

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

UNIT V MOTOR CONTROL & Applications 9

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

TOTAL: 45

TEXT BOOK:

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

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

ELECTIVE – IV

22152E74BP **SEMESTER VII**

ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

3 0 0 3

OBJECTIVES

- To expose the students to the fundamentals of microprocessor architecture.
- To introduce the advanced features in microprocessors and microcontrollers.
- To enable the students to understand various microcontroller architectures.

UNIT I HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

CPU Architecture- Bus Operations – Pipelining – Brach predication – floating point unit- Operating Modes –Paging – Multitasking – Exception and Interrupts – Instruction set – addressing modes – Programming the Pentium processor.

UNIT II HIGH PERFORMANCE RISC ARCHITECTURE – ARM 9

Arcon RISC Machine – Architectural Inheritance – Core & Architectures - Registers – Pipeline - Interrupts – ARM organization - ARM processor family – Co-processors - ARM instruction set- Thumb Instruction set - Instruction cycle timings - The ARM Programmer‟‟s model – ARM Development tools – ARM Assembly Language Programming - C programming – Optimizing ARM Assembly Code – Optimized Primitives.

UNIT III ARM APPLICATION DEVELOPMENT 9

Introduction to DSP on ARM –FIR filter – IIR filter – Discrete fourier transform – Exception handling – Interrupts – Interrupt handling schemes- Firmware and bootloader – Embedded Operating systems – Integrated Development Environment- STDIO Libraries – Peripheral Interface – Application of ARM Processor - Caches – Memory protection Units – Memory Management units – Future ARM Technologies.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instruction set addressing modes – operating modes- Interrupt system- RTC-Serial Communication Interface – A/D Converter PWM and UART.

UNIT V PIC MICROCONTROLLER 9

CPU Architecture – Instruction set – interrupts- Timers- I2C Interfacing –UART- A/D Converter –PWM and introduction to C-Compilers.

TOTAL: 45

TEXT BOOK:

1. Andrew N.Sloss, Dominic Symes and Chris Wright " ARM System Developer's Guide : Designing and Optimizing System Software" , First edition, Morgan Kaufmann Publishers, 2004.

REFERENCES:

1. Steve Furber , "ARM System –On –Chip architecture", Addision Wesley, 2000.
2. Daniel Tabak , "Advanced Microprocessors", Mc Graw Hill. Inc., 1995
3. James L. Antonakos , " The Pentium Microprocessor", Pearson Education, 1997.
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.Brey,"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 – IV

22152E74CP **SEMESTER VII**

ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I BASIC CONCEPTS 9

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

UNIT II EMI MEASUREMENTS 9

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

UNIT III EMC STANDARD AND REGULATIONS 8

National and 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.
2. Donwhite Consultant Incorporate , “Handbook Of EMI / EMC” , Vol I , 1985

ELECTIVE – IV

22152E74DP **SEMESTER VII**

SOLID STATE ELECTRONIC DRIVES 3 0 0 3

AIM

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

OBJECTIVES:

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

UNIT I: 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

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

ELECTIVE – IV

22152E74EP **SEMESTER VII**

COMPUTER HARDWARE AND INTERFACING 3 0 0 3

AIM

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

OBJECTIVES

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

UNIT I CPU AND MEMORY 9

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

UNIT II MOTHERBOARDS 9

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

UNIT III STORAGE DEVICES 9

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

UNIT IV I/O PERIPHERALS 9

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

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 TO BE UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

M.TECH – COMMUNICATION SYSTEMS
[FULL TIME]

[REGULATION 2022]

M.TECH. COMMUNICATION SYSTEMS - FULL TIME-R-2022

SEMESTER I – IV CURRICULUM

SEMESTER I

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	22248S11B	Applied Mathematics for Electronics Engineering	3	1	0	4
2	22271C12	Advanced Digital Signal Processing	3	1	0	4
3	22271C13	Advanced Digital Communication Techniques	3	1	0	4
4	22271C14	Optical Networks	4	0	0	4
5	22271C15	Advanced Radiation Systems	4	0	0	4
6	**22271E16_**	**Elective-I**	3	0	0	3
Practical						
7	22271L17	Communication Systems Lab – I	0	0	3	3
		Total	20	3	3	**26**

SEMESTER II

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	22271C21	Mobile Communication Networks	4	0	0	4
2	22271C22	Advanced Microwave Systems	4	0	0	4
3	22271C23	Electromagnetic Interference and Compatibility	4	0	0	4
4	**22271E24_**	**Elective-II**	**3**	**0**	**0**	**3**
5	**22271E25_**	**Elective-III**	**3**	**0**	**0**	**3**
Practical						
6	22271L26	Communication Systems Lab – II	0	0	3	3
7	222TECWR	Technical Writing /Seminars	0	0	3	3
		Total	18	0	6	**24**

SEMESTER III

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	22271C31	Wireless Sensor Networks	4	0	0	4
2	**22271E32_**	**Elective – IV**	**3**	**0**	**0**	**3**
3	**22271E33_**	**Elective – V**	**3**	**0**	**0**	**3**
4	**22271E34_**	**Elective – VI**	**3**	**0**	**0**	**3**
Project						
5	22271P35	Project Phase – I	0	0	10	10
		Total	13	0	10	**23**

SEMESTER IV

S.N	SUB CODE	SUBJECT	L	T	P	C
1	22271P41	Project Phase – II	0	0	15	15
		Total	0	0	15	**15**
					TOTAL NO. OF CREDITS	**88**

LIST OF ELECTIVES

Elective-I (SEMESTER – I)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E16A	Internetworking and Multimedia	3	0	0	3
2.	22271E16B	Digital Image Processing	3	0	0	3
3.	22271E16C	LASER Communication	3	0	0	3

Elective-II (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E24A	High Speed Switching Architecture	3	0	0	3
2.	22271E24B	DSP Processor Architecture and Programming	3	0	0	3
3.	22271E24C	Digital Speech Processing	3	0	0	3

Elective-III (SEMESTER – II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E25A	Digital Communication Receivers	3	0	0	3
2.	22271E25B	Soft Computing Techniques	3	0	0	3
3.	22271E25C	Communication Network Security	3	0	0	3

Elective-IV (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E32A	Software Defined Radio	3	0	0	3
2.	22271E32B	Satellite Communication	3	0	0	3
3.	22271E32C	CDMA Systems	3	0	0	3

Elective-V (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E33A	Wavelets and Multi Resolution Processing	3	0	0	3
2.	22271E33B	High Performance Communication Networks	3	0	0	3
3.	22271E33C	Advanced Microprocessors and Microcontrollers	3	0	0	3

Elective-VI (SEMESTER – III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E34A	Space Time Wireless Communication	3	0	0	3
2.	22271E34B	Medical Imaging	3	0	0	3
3.	22271E34C	Mobile ADHOC Networks	3	0	0	3

M.TECH. COMMUNICATION SYSTEMS - FULL TIME-R-2022

Course Structure and Credit Distribution

Sem.	Core Courses						Elective Courses		Foundation Courses		Total Credits
	Theory Courses		Practical Courses		Courses on *RSD						
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	04	16	01	03	-	-	01	03	01	04	26
II	03	12	02	06	-	-	02	06	-	-	24
III	01	04	01	10	-	-	03	09	-	-	23
IV	-	-	01	15	-	-	-	-	-	-	15
Total Credits											**88**

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

22248S11B 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 poblems using mathematical tools from a variety of mathematical areas, including fuzzy logic, matrix linear programming, probability, numerical solution of ordinary differential equations and queuing models.

UNIT I CALCULUS OF VARIATIONS 9

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

UNIT II INTEGRAL TRANSFORMS AND WAVE EQUATIONS 9

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

UNIT III LINEAR PROGRAMMING 9

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

UNIT IV RANDOM PROCESS AND QUEUING THEORY 9

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

UNIT V TESTING OF HYPOTHESIS 9

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

Tutorial :15 Total:60

OUTCOMES:

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

- Concepts on vector spaces, linear transformation, inner product spaces, eigenvalues and generalized eigenvectors.

- Apply various methods in linear algebra to solve systems of linear equations.
- Could develop a fundamental understanding of linear programming models, able to develop a linear programming model from problem description, apply the simplex method for solving linear programming problems.
- Numerical solution of differential equations by single and multistep methods.
- Computation of probability, random variables and their associated distributions, correlations and regression.
- Conceptualize the principle of optimality and sub-optimization, formulation and computational procedure of dynamic programming.
- Exposing the basic characteristic features of a queuing system and acquiring skills in analyzing queuing models.
- Using discrete time Markov chains to model computer systems.

BOOKS FOR REFERENCES :

1. Grewal.B.S. "Higher Engineering Mathematics", Khanna Publications, 2005.
2. Kapoor.J.N. &Saxena.H.C., Mathematical Statistics, S.Chand& Co., New Delhi.
3. Taha.H.A. "Operation Research – An Introduction", 6^{th} Edition, PHI, 2297.
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., 2299
7. T.Veerarajan, Probability, Statistics and Random Processes, TMH, 2002

SEMESTER I

22271C12 STATISTICAL SIGNAL PROCESSING

L	T	P	C
3	1	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

Wide sense stationary process – Ergodic process – Mean – Variance - Auto-correlation and Auto-correlation matrix - Properties - Weiner Khitchine relation - Power spectral density – filtering random process, Spectral Factorization Theorem–Finite Data records,Simulation of uniformly distributed/Gaussian distributed white noise – Simulation of Sine wave mixed with Additive White Gaussian Noise.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency of estimators - Non-Parametric methods - Correlation method - Co-variance estimator - Performance analysis of estimators – Unbiased consistent estimators – Periodogram estimator - Barlett spectrum estimation - Welch estimation.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Model based approach - AR, MA, ARMA Signal modeling - Parameter estimation using Yule-Walker method - Maximum likelihood criterion - Efficiency of estimator - Least mean squared error criterion – Wiener filter - Discrete Wiener Hoff equations – Mean square error.

UNIT IV ADAPTIVE FILTERS 9

Recursive estimators - Kalman filter - Linear prediction — Forward prediction and Backward prediction, Prediction error - Whitening filter, Inverse filter - Levinson recursion, Lattice realization, Levinson recursion algorithm for solving Toeplitz system of equations.

UNIT V MULTIRATE DIGITAL SIGNAL PROCESSING 9

FIR Adaptive filters - Newton's steepest descent method - Adaptive filters based on steepest descent method - Widrow Hoff LMS Adaptive algorithm - Adaptive channel equalization - Adaptive echo canceller - Adaptive noise cancellation - RLS Adaptive filters - Exponentially weighted RLS – Sliding window RLS - Simplified IIR LMS Adaptive filter.

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, Weiner 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. John G. Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Prentice Hall of India, New Delhi, 2005.
2. Monson H. Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons Inc.,New York, 2006.
3. P. P. Vaidyanathan, "Multirate Systems and Filter Banks", Prentice Hall, 2292.
4. Simon Haykin, "Adaptive Filter Theory", Prentice Hall, Englehood Cliffs, NJ2286.
5. S. Kay," Modern spectrum Estimation theory and application", Prentice Hall, Englehood Cliffs, NJ2288.
6. Sophoncles J. Orfanidis, "Optimum Signal Processing ", McGraw-Hill, 2000.

SEMESTER I

22271C13 ADVANCED DIGITAL COMMUNICATION TECHNIQUES

L T P C
31 0 4

AIM:

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

OBJECTIVES:

- To understand the basics of signal-space analysis and digital transmission.
- 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
- 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; MFSK receivers – Rayleigh and Rician channels – Partially coherent receivers – DPSK; M-PSK; M-DPSK-BER Performance Analysis. Carrier SynchronizationBit synchronization.

UNIT II EQUALIZATION TECHNIQUES 9

Band Limited Channels- ISI – Nyquist Criterion- Controlled ISI-Partial Response signals- Equalization algorithms – Viterbi Algorithm – Linear equalizer – Decision feedback equalization – Adaptive Equalization algorithms.

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. Space time block 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 MULTICARRIER AND MULTIUSER COMMUNICATIONS 9

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, suboptimum detectors, successive interference cancellation.

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. Bernard Sklar, "Digital Communications", second edition, Pearson Education, 2001.
2. John G. Proakis, "Digital Communication", Fifth Edition, Mc Graw Hill Publication, 2008.
3. M.K.Simon, S.M.Hinedi and W.C.Lindsey, "Digital communication techniques; Signal Design and Detection", Prentice Hall of India, New Delhi, 2295.
4. Richard Van Nee & Ramjee Prasad, "OFDM for Multimedia Communications" Artech House Publication, 2001.
5. Stephen G. Wilson, "Digital Modulation and Coding", First Indian Reprint, Pearson Education, 2003.
6. Simon Haykin, "Digital communications", John Wiley and sons, 2298.
7. Theodore S.Rappaport, „Wireless Communications", 2nd edition, Pearson Education, 2002.

SEMESTER I

22271C14 OPTICAL NETWORKS **L T P C**
4 0 0 4

AIM:

To expose the students to the Optical system components like optical amplifiers, wavelength converters.

OBJECTIVES:

The students should be made to understand:

- Up-to-date survey of development in Optical Network Architectures.
- Packet switching.
- Network design perspectives.
- Different Optical Network management techniques and functions.

UNIT I INTRODUCTION TO OPTICAL NETWORKS 9

Introduction to Optical Networks: Telecommunications Networks Architecture, Services, circuit switching and packet switching, Optical Networks: Multiplexing Techniques, Second generation Optical Networks, Optical Packet Switching, Transmission Basics: Wavelength, frequencies, andchannel spacing, Wavelength standards, Optical power and loss, Network Evolution, Nonlinear Effects: Self-phase Modulation, Cross-phase Modulation, Four Wave mixing, Solitons. Components: Couplers, Isolators and Circulators, Multiplexers and Filters, Optical Amplifiers, Transmitters, Detectors, Switches, Wavelength Converters.

UNIT II TRANSMISSION SYSTEM ENGINEERING 9

System Model, Power Penalty, Transmitter, Receiver, Optical Amplifiers, Crosstalk, Dispersion, Wavelength Stabilization, Overall Design Considerations. Optical Internets: Migration to IP optical networking, IP and Optical backbone, IP Routing table, MPLS and optical cross connect table, Protocol stack Alternatives, Internetworking SS7 and Legacy Transport, Internet transport network protocol stack.

UNIT III OPTICAL TRANSPORT NETWORKS 9

SONET, SDH and Optical Transport Networks (OTNs): SONET and SDH: SONET multiplexing hierarchy, Frame structure, Functional Component, problem detection, concatenation. Architecture of Optical Transport Networks (OTNs): Digital wrapper, in-band and out-of band control signalling, Importance of Multiplexing and multiplexing hierarchies, SONET multiplexing hierarchies, SDH multiplexing hierarchies, New Optical Transport, OTN layered Model, Generic Framing Procedure (GFP).

UNIT IV NETWORK TOPOLOGIES 9

WDM, Network topologies, MPLS and Optical Networks: WDM: WDM operation, Dense Wavelength Division Multiplexing (DWDM), Erbium-doped Fiber (EDF), WDM amplifiers, Add-Drop Multiplexers, Wavelength Continuity Property, Higher dispersion for DWDM, Tunable DWDM Lasers.

UNIT V NETWORK TOPOLOGIES AND PROTECTION SCHEMES 9

Robust networks, Line and path protection switching, Types of topology, Point to point topology, bi-directional line-switched ring (BLSR), meshed topology, Passive optical networks, Metro optical networks 28 MPLS and Optical Networks: IS label switching, Forwarding equivalence class (FEC), Types of MPLS nodes, Label distribution and binding, label swapping and traffic forwarding, MPLS support of Virtual Private Networks (VPN), MPLS traffic engineering, Multi protocol Lambda switching (MPIS).

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 – Practical Perspective", 3rd Edition,Morgan - Kaufmann Publishers.
2. Optical Networks, Third Generation Transport Systems, Uyless Black, Pearson

SEMESTER I

22271C15 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 I ANTENNA FUNDAMENTALS **9**

Antenna fundamental parameters, Radiation integrals ,Radiation from surface and line current distributions – dipole, monopole, loop antenna; Mobile phone antenna- base station, handset antenna; Image; Induction ,reciprocity theorem, Broadband antennas and matching techniques, Balance to unbalance transformer, Introduction to numerical techniques.

UNIT II RADIATION FROM APERTURES **9**

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna; Reflector antenna, aperture blockage, and design consideration.

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 Fraunhofer and Fresnel diffraction.Complimentary screens and slot antennas. Slot and dipoles as dual antennas. Fourier transform of 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 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 2298
3. Jordan, E.C., “ Electromagnetic waves and Radiating systems”. PHI 2003
4. Krauss, J.D., “ Radio Astronomy” McGraw-Hill 2266, for the last unit (reprints available)
5. Krauss, J.D.,,Fleisch,D.A., “Electromagnetics” McGraw-Hill,2299

SEMESTER I

22271L17 COMMUNICATION SYSTEM LAB- I

LT 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.

LIST OF ELECTIVES

ELECTIVE – I (SEMESTER I)

ELECTIVE -I
SEMESTER I

22271E16A INTERNETWORKING AND MULTIMEDIA **L T P C**
3 0 0 3

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 subject, students will be able to:

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

BOOKS FOR REFERENCES :

1. Jon Crowcroft, Mark Handley, Ian Wakeman, Internetworking Multimedia, Harcourt Asia Pvt. Ltd.Singapore, 2298.
2. B.O. Szuprowicz, Multimedia Networking, McGraw Hill, Newyork. 2295.
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 ,

ELECTIVE -I
SEMESTER I

22271E16B DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

AIM:

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

OBJECTIVES:

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

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

UNIT II IMAGE TRANSFORMS 9

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

UNIT III ENHANCEMENT AND RESTORATION 9

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

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

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

UNIT V IMAGE COMPRESSION 9

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

Total:45 Periods

OUTCOMES:

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

- Explain the fundamentals of digital image processing.

- 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, PearsonEducation Inc., 2004.
2. Anil K. Jain, ‘Fundamentals of Digital Image Processing’, Prentice Hall of India, 2002.
3. David Salomon , “Data Compression The Complete Reference”, 2nd Edition, SpringerVerlag , New York Inc., 2001.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education, Inc., 2004.
5. William K. Pratt, “Digital Image Processing”, John Wiley, NewYork, 2002.
6. MilmanSonka, Vaclav Hlavac, Roger Boyle, “Image Processing Analysis and Machine Vision”, 2nd edition, Brooks/Cole, Vikas Publishing House, 2299.

ELECTIVE -I
SEMESTER I

22271E16C **LASER COMMUNICATION** **L T P C**
3 0 0 3

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

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

UNIT I LASER COMMUNICATIONS 9
Atmospheric low loss windows, optical sources and detectors for these windows, Characteristics of source and detectors. Optical transmitting and receiving antennas.

UNIT II SYSTEM DESIGN 9
Link equation, Transmitter terminal, Antenna design, Antenna gain, Beam width, C/N, Optical detectors, Optical modulation formats, Deriving error statistics, Signal requirements for acquisition and tracking, Fundamentals of system design.

UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9
Performance and Geometries, output wavelength control, Semiconductor laser lifetime, Direct and indirect modulation techniques and radiation effects.

UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9
Direct detection, coherent detection and demodulation. Gimbals in transceiver design, Receiver options and optics; Lasers; antennas / Telescope, Internal optical systems, Transmitter analysis.

UNIT V LASER BEAM POINTING CONTROL 9
Acquisition and Tracking systems, System description, Acquisition methodology, racking and pointing control system, RF cross link system design, link equation.

Total:45 Periods

Outcomes:
Students are able to
- Recognize and classify the structures of Optical fiber and types.
- Discuss the channel impairments like losses and dispersion.
- Analyze various coupling losses.
- Classify the Optical sources and detectors and to discuss their principle.
- Familiar with Design considerations of fiber optic systems.
- To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.

BOOKS FOR REFERENCES :

1. Morris Katzman, “Laser Satellite Communications”, Prentice Hall Inc, New York, 2291.
2. J. Franz and V.K.Jain, “Optical Communication Systems”, Narosa Publication, New Delhi, 2294.

22271C21 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 WIRELESS CHANNEL PROPAGATION AND MODEL 9

Propagation of EM signals in wireless channel–Reflection, diffraction and Scattering-Small scale fading-channel classification-channel models–COST-231 Hata model, Longley-Rice Model,NLOS Multipath Fading Models: Rayleigh, Rician, Nakagami, Composite Fading–shadowingDistributions, Link power budget Analysis

UNIT II OPERATION AND PROPAGATION MODELS AND AIR PROTOCOLS 9

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

UNIT III MOBILE NETWORK ARCHITECTURE 9

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

UNIT IV WIRELESS LOCAL AREA NETWORKS 9

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

UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 9

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

Total:45 Periods

Outcomes :

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

BOOKS FOR REFERENCES :

1. W. Stallings, "Wireless Communications and Networks",Second Edition Prentice Hall, 2007.
2. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
3. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall,2002.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and 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. UylessBlack ,"Mobile and Wireless Networks" , Prentice Hall PTR, 2296.

22271C22 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 INTRODUCTION TO MONOLITHIC MICROWAVE INTEGRATED CIRCUITS 9

Introduction to Monolithic Microwave Integrated Circuits (MMICs), their advantages over discrete circuits, materials, MMIC fabrication techniques, MOSFET fabrication. Thin film formation.

UNIT II MICROSTRIP ANALYSIS 9

Planar transmission lines for MICs. Method of conformal transformation for microstrip analysis, concept of effective dielectric constant, Effective dielectric constant for microstrip, Losses in Microstrip

UNIT III SLOT LINE ANALYSIS 9

Slot Line Approximate analysis and field distribution, Transverse resonance method and evaluation of slot line impedance, comparison with micro strip line.

UNIT IV LUMPED ELEMENTS FOR MICS 9

Lumped Elements for MICs: Use of Lumped Elements, Capacitive elements, Inductive elements and Resistive elements.

UNIT V MICROWAVE SEMICONDUCTOR DEVICES & MICROWAVE PASSIVE COMPONENTS 9

Microwave semiconductor Devices & Microwave passive components Parametric amplifiers, tunnel diode, varactor diode, PIN diode, Gunn diode, their principle of operation, performance characteristics & applications, scattering parameter calculations of E plane-Tee, Magic Tee, Directional Coupler.

Total:45 Periods

OUTCOMES:

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

REFERENCES:

1. Gupta,K.C, and Amarjitsingh "Microwave Integrated Circuits" John Wiley and sons – Wiley EasternReprint, 2278.
2. Hoffmann, R.K "Handbook of Microwave Integrated Circuits" Artech House, 2287.

SEMESTER II

22271C23 ELECTRO MAGNETIC INTERFERENCE AND COMPATIBILITY

L	T	P	C
4	0	0	4

AIM:

The aim of the course is to familiarize the basics of EMI and EMI sources.

OBJECTIVES:

The students should be made to be familiar with:

- EMI problems.
- Solution methods in PCB.
- Measurements techniques for emission.
- Measurement techniques for immunity.

UNIT I BASIC THEORY 9

Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories EMC Engineering Application.

UNIT II COUPLING MECHANISM 9

Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radioactive coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III EMI MITIGATION TECHNIQUES 9

Working principle of Shielding and Murphy‟s Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient Protection.

UNIT IV STANDARD AND REGULATION 9

Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

UNIT V EMI TEST METHODS AND INSTRUMENTATION 9

Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber , Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

Total:45 Periods

OUTCOMES:

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

- Identify Standards
- Compare EMI test methods
- Discuss EMI mitigation techniques

BOOKS FOR REFERENCES :

1. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Ed, Artech house, Norwood,2286.
2. Clayton Paul, "Introduction to Electromagnetic Compatibility", Wiley Interscience, 2006.
3. Daryl Gerke and William Kimmel, "EDN"s Designer"s Guide to Electromagnetic Compatibility",Elsevier Science & Technology Books, 2002
4. Dr Kenneth L Kaiser, "The Electromagnetic Compatibility Handbook", CRC Press 2005.
5. Electromagnetic Compatibility by Norman Violette ,Published by Springer, 2013
6. Electromagnetic Interference and Compatibility: Electrical noise and EMI specifications Volume 1of A Handbook Series on Electromagnetic Interference and Compatibility, Donald R. J. White Publisher-Don white consultants Original from the University of Michigan Digitized 6Dec 2007.
7. Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork,2009
8. V Prasad Kodali, "Engineering Electromagnetic Compatibility", IEEE Press, Newyork, 2001.
9. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", JohnWiley & Sons Inc., (Wiley Interscience Series) 2297.

LIST OF ELECTIVES

ELECTIVE – II (SEMESTER II)

ELECTIVE -II
SEMESTER II

22271E24A HIGH SPEED SWITCHING ARCHITECTURE **L T P C**
3 0 0 3

AIM:

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

OBJECTIVES:

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

UNIT I HIGH SPEED NETWORK **9**

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

UNIT II LAN SWITCHING TECHNOLOGY **9**

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

UNIT III ATM SWITCHING ARCHITECTURE **9**

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

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS **9**

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

UNIT V IP SWITCHING **9**

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

Total:45 Periods

OUTCOMES:

- The student would be able to identify suitable switch architectures for a specified networking scenario and demonstrate its blocking performance.

- 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. AchillePatavina, Switching Theory: Architectures and performance in Broadband ATM Networks.John Wiley & Sons Ltd., New York.2298.
2. Christopher Y Metz, Switching protocols & Architectures. McGraw Hill, New York.2298.
3. Ranier Handel, Manfred N Huber, Stefan Schrodder. ATM Networks-concepts, protocols, applications,3rd Edition, Adisson Wesley, New York,2299.
4. John A.Chiong: Internetworking ATM for the internet and enterprise networks. McGraw Hill, NewYork, 2298.

ELECTIVE -II
SEMESTER II

22271E24B DSP PROCESSOR ARCHITECTURE AND PROGRAMMING

L	T	P	C
3	0	0	3

AIM:

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

OBJECTIVES:

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

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

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

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

UNIT II TMS320C3X PROCESSOR 9

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

UNIT III ADSP PROCESSORS I 9

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

UNIT IV ADVANCED PROCESSORS 9

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

UNIT VADVANCED PROCESSORS II 9

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

Total:45Periods

OUTCOMES:

Students should be able to:

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

BOOKS FOR REFERENCES :

1. B.Venkataramani and M.Bhaskar, "Digital Signal Processors – Architecture, Programming andApplications" – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.

2. User guides Texas Instrumentation, Analog Devices, Motorola.

ELECTIVE -II
SEMESTER II

22271E24C DIGITAL SPEECH PROCESSING **L T P C**
3 0 0 3

AIM:

To illustrate the concepts of speech signal representations and coding.

OBJECTIVES:

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

UNIT I MECHANICS OF SPEECH 9

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

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

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

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

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

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

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

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9

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

Total:45 Periods

OUTCOMES:

Students will be able to:

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.

- 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 - 2278
3. Quatieri – Discrete-time Speech Signal Processing – Prentice Hall – 2001.
4. J.L.Flanagan – Speech analysis: Synthesis and Perception – 2nd edition – Berlin – 2272
5. I.H.Witten – Principles of Computer Speech – Academic Press – 2282

LIST OF ELECTIVES

ELECTIVE – III (SEMESTER II)

ELECTIVE -III
SEMESTER II

22271E25A DIGITAL COMMUNICATION RECEIVERS L T P C
3 0 0 3

AIM:

The aim of this course is to understand the basic principles of digital communication techniques.

OBJECTIVES:

- To understand the basic principles of digital communication techniques.
- To gain knowledge about receivers for AWGN channel and Fading channels.
- To understand the concepts of synchronization and adaptive equalization techniques.

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Baseband and bandpass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

Total:45 Periods

OUTCOMES:

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

- Apply basic principles of digital communication techniques.
- Discuss on receivers for AWGN & Fading channel
- Describe various synchronization techniques.

- Design adaptive equalization algorithms to satisfy the evolving demands in digital communication.

BOOKS FOR REFERENCES :

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, “Digital Communication Receivers”, VolI&II, John Wiley, New York, 2297
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, 2294
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, 2298

ELECTIVE -III
SEMESTER II

22271E25B SOFT COMPUTING TECHNIQUES L T P C
3 0 0 3

AIM:

The aim of this course is to know the basics of artificial neural networks.

OBJECTIVES:

- To provide adequate knowledge about feed forward /feedback neural networks
- To apply the concept of fuzzy logic in various systems.
- To have the idea about genetic algorithm.
- To provide adequate knowledge about the applications of Soft Computing.

UNIT I ARTIFICIAL NEURAL NETWORKS 9

Introduction-Basic concepts of Neural Network-Model of an Artificial Neuron-Characteristics of Neural Network-Learning Methods-Backpropagation Network Architecture-Backpropagation Learning-Counter PropagationNetwork-Hopfield/RecurrentNetwork- Adaptive Resonance Theory.

UNIT II FUZZY LOGIC 9

Basic concepts of Fuzzy Logic-Fuzzy Sets and Crisp Sets-Fuzzy Set Theory and Operations-Properties of Fuzzy Sets-Fuzzy and Crisp relations, Fuzzy to Crisp Conversion- Membership Functions-Interference in Fuzzy Logic-Fuzzy if-then Rules, Fuzzy implications and Fuzzy Algorithms,Fuzzification & Defuzzification-Fuzzy Controller.

UNIT III NEURO-FUZZY MODELLING 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 GENETIC ALGORITHMS 9

Basic concepts-Working Principle-Inheritance Operators-Cross Over-Inversion & Deletion-Mutation Operator-Generation Cycle.

UNIT V APPLICATIONS OF SOFTCOMPUTING 9

Genetic Algorithm Application- Bagley and Adaptive Game-Playing Program- Greg Viols Fuzzy Cruise Controller-Air Conditioner Controller-Application of Back Propagation Neural Network.

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. George J. Klir and Bo Yuan, „Fuzzy Sets and Fuzzy Logic Theory and Applications‟, Printice Hall of India, 2002.
2. J.S.R.Jang,C.T.Sun and E.Mizutani,"Neuro-Fuzzy and Soft Computing",PHI,2004, Pearson Education 2004.
3. Laurene Fausett,"Fundamentals of Neural Networks: Architectures, Algorithms and Pearson Education India, 2006.
4. S.Rajasekaran and G.A.V.Pai."Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2010.
5. Timothy J Ross, “Fuzzy logic with Engineering Applications”, John Wiley and Sons, 2009.
6. Zimmermann H.J."Fuzzy Set Theory and Its Application" Springer International Edition, 2011.

ELECTIVE -III
SEMESTER II

22271E25C COMMUNICATION NETWORK SECURITY L T P C
3 0 0 3

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 Countermeasures; 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

22271L26 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.

SEMESTER III

22271C31 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 SensorNetworks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of SensorNodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, GatewayConcepts.

UNIT III NETWORKING SENSORS 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for WirelessSensor Networks, Low Duty Cycle Protocols and Wake Up Concepts - S-MAC , TheMediation Device Protocol, Wake Up Radio Concepts, Address and Name Management,Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning,Sensor Tasking and Control.

UNIT V SENSOR NETWORK ARCHITECTUREAND MAC PROTOCOLS 9

Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks. , physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management - MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error control, framing, link management.

TOTAL- 45 PERIODS

OUTCOMES:

- Familiar with the latest 4G networks and LTE
- Understand about the wireless IP architecture and LTE network architecture.
- Familiar with the adaptive link layer and network layer graphs and protocol.
- Understand about the mobility management and cellular network.
- Understand about the wireless sensor network architecture and its concept.

BOOKS FOR REFERENCES:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

LIST OF ELECTIVES

ELECTIVE – IV (SEMESTER III)

ELECTIVE -IV
SEMESTER III

22271E32A SOFTWARE DEFINED RADIO **L T P C**
3 0 0 3

AIM:

The aim of this course is to understand the concepts of software defined radio.

OBJECTIVES:
The students should be made to be

- Understand the concepts of software defined radio
- Learn spectrum sensing and dynamic spectrum access

UNIT I: Introduction to SDR 9
The Need for Software Radios-Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio.Radio frequency implementation issues-The Purpose of the RF Front-End. Dynamic Range: The Principal Challenge of Receiver Design. RF Receiver Front-End Topologies. Enhanced Flexibility of the RF Chain with Software Radios. Importance of the Components -Transmitter Architectures and their Issues. Noise and Distortion in the RF Chain. ADC and DAC Distortion.

UNIT II :Direct Digital Synthesis 9
Introduction. Comparison of Direct Digital Synthesis with Analog Signal Synthesis. Approaches to Direct Digital Synthesis. Analysis of Spurious Signals. Spurious Components due to Periodic Jitter. Band pass Signal Generation. Performance of Direct Digital Synthesis Systems. Hybrid DDS-PLL Systems. Applications of direct Digital Synthesis. Generation of Random Sequences. ROM Compression Techniques.

UNIT III Signal Processor and Multi Rate Processing Techniques 9
Introduction. Sample Rate Conversion Principles. Polyphase Filters. Digital Filter Banks. Timing Recovery in Digital Receivers Using Multirate Digital Filters.
DSP Processors; Field Programmable Gate Arrays; Trade-Offs in Using DSPs, FPGAs, and ASICs; Power Management Issues; Using a Combination of DSPs, FPGAs, and ASICs.

UNIT IV: Smart Antennas 9
Vector channel modeling; Benefits of smart antennas; Structures for Beam forming Systems; Smart Antenna Algorithms.Diversity and Space-Time Adaptive Signal Processing; Algorithms for Transmit STAP; Hardware Implementation of Smart Antennas; Array Calibration.

UNIT V: Applications –Wireless Aspects of Tele-Health Care 9
The application of advanced telecommunication , the special requirements especially related to reliability, privacy and trust, Regulatory and safety aspects of tele-health care, Cognitive radio and flexible spectrum usage for tele-healthcare, Cooperative Communications for Tele-health. Case studies: JTRS radio system ,Software defined base stations.

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 0-622-15931-6

22271E32B SATELLITE COMMUNICATION L T P C
3 0 0 3

AIM:

To understand the basics of satellite orbits.To understand the satellite segment and earth segment.

OBJECTIVES:

The students should be made to be

- Learn M2M developments and satellite applications
- Understand Satellite Communication In Ipv6 Environment

UNIT I ORBITAL MECHANICS 9

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations,Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT II SPACECRAFT SUBSYSTEMS AND EARTH STATION 9

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems,Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III SPACE LINKS 9

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS 9

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS).Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures.
Hybrid satellite-terrestrial networks

UNIT V SERVICES AND APPLICATIONS 9

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS,INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Videoconferencing and Internet connectivity

OUTCOMES:

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

- Discuss satellite navigation and global positioning system
- Outline deep space networks and inter planetary missions

BOOKS FOR REFERENCES:

1. Dennis Roddy, "Satellite Communications", 3rd Edition, McGraw Hill International Editions, 2001
2. Bruce R.Elbert, "Introduction to Satellite Communication" ,Artech House Inc.,2299.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, "Satellite Communications", 2nd Edition, Wiley, John& Sons, 2002
4. Wilbur L.Pritchard, HendriG.Suyderhood, Robert A.Nelson, "Satellite Communication SystemsEngineering", 2nd Edition, Prentice Hall, New Jersey, 2293
5. Tri T.Ha, "Digital satellite communication", 2nd Edition, McGraw Hill, New york.2290.

ELECTIVE -IV
SEMESTER III

22271E32C **CDMA SYSTEMS** **L T P C**
3 0 0 3

AIM:

The aim of this course is to define the basics of cellular communications and explain the Architecture OF GSM & its Radio Channels.

OBJECTIVES:

The students should be made to be

- understand cellular concept, widely popular 2G digital, TDMA based mobile system GSM and modern mobile wireless system CDMA.

UNIT I BASIC CONCEPTS OF CDMA **9**

Spread spectrum communication techniques (DS-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 & demodulationprocess , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS **9**

Multicarrier CDMA, System design , Performance parameters – BER lower bound,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA **9**

Prime Codes and it’s properties, Generalized and Extended Prime Codes,Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multi wavelength Optical CDMA networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Analyze MIMO system.
- Discuss millimeter wave communication.
- Demonstrate software defined radio and cognitive radio.

BOOKS FOR REFERENCES:

1. John G.Proakis, “Digital Communications”, McGraw Hill International Ltd,4th ed., Singapore, 2000.
2. Andrew J. Viterbi, “ CDMA: Principles of Spread Spectrum Communication”,Addison-Wesley, 1sted. , 2295.

3. KavethPahlavan,. K. PrashanthKrishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, “IS –95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation”, Pearson Education , 2st ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, ” OFDM for Wireless Multimedia Communication” , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, “Wireless Communication”, Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, “GSM CDMA One and 3GSystems”, Wiley India, 2004.
8. Guu-Chang Yang, “Prime Codes with Application to Optical and Wireless Networks”, Artech House, Inc., 2002.

LIST OF ELECTIVES

ELECTIVE – V (SEMESTER III)

ELECTIVE - V
SEMESTER III

22271E33A WAVELETS AND MULTIRESOLUTION PROCESSING

L T P C
3 0 0 3

AIM:

To introduce the fundamentals concepts of wavelet transforms.

OBJECTIVE:

- To study system design using Wavelets
- To learn the different wavelet families & their applications.

UNIT I INTRODUCTION 9

Vector Spaces - properties - dot product - basis - dimension, orthogonality and orthonormality - relationship between vectors and signals - Signal spaces - concept of Convergence – GeneralisedFourier Expansion.

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA Wavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks

UNIT III CONTINUOUS WAVELET TRANSFORM 9

Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet,Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time -scale plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Bank and sub band coding principles - Wavelet Filters - Inverse DWT computation by Filterbanks -Basic Properties of Filter coefficients - Choice of wavelet function coefficients - Derivations of Daubechies Wavelets - Multi-band Wavelet transforms. Introduction to lifting Scheme

UNIT V APPLICATIONS 9

Signal Compression – Image Compression techniques: EZW-SPHIT Coding - Image denoisingtechniques:Noise estimation - Shrinkage rules -. Shrinkage Functions - Edge detection and object Isolation, Image Fusion, and Object Detection.

TOTAL : 45 PERIODS

OUTCOME:

- The students will be able to apprehend the detailed knowledge about the Wavelet transform & its applications.

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, 2296
3. Vetterli M, Kovacevic J., "Wavelets and Sub-band Coding," Prentice Hall, 2295
4. Mallat S., "Wavelet tour of Signal Processing", Academic Press, 2296
5. David C.Lay., "Linear Algebra and its applications" Pearson education, 2007.(Unit I only)

ELECTIVE - V
SEMESTER III

22271E33B HIGH PERFORMANCE COMMUNICATION NETWORKS

L	T	P	C
3	0	0	3

AIM:

To familiarize concepts and terminology associated with ATM, Frame Relay, MPLS, Bluetooth technology**.**

OBJECTIVES:

- To appreciate the need for interoperable network management as a typical distributed application
- To be aware of current trends in network technologies

UNIT I PACKET SWITCHED NETWORKS 9

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI,DQDB, SMDS: Internetworking with SMDS

UNIT II ISDN AND BROADBAND ISDN 9

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY 9

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.

Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

UNIT IV ADVANCED NETWORK ARCHITECTURE 9

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V BLUETOOTH TECHNOLOGY 9

The Bluetooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio, The Link Manager, The Host controller interface; The Bluetooth module-Protocol stack Part I:Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Diagnose problems and make minor repairs to computer networks using appropriate diagnostics software
- Demonstrate how to correctly maintain LAN computer systems
- Maintain the network by performing routine maintenance tasks
- Apply network management tools

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. SumitKasera, PankajSethi, “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 PravinVaraiya ,”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.

ELECTIVE - V
SEMESTER III

22271E33C ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P C
3 0 0 3

AIM:

To introduce the advanced features in microprocessors and microcontrollers.

OBJECTIVES:

- To enable the students to understand various microcontroller architectures
- To expose the students to the fundamentals of microprocessor architecture.

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline –pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipelining – Branch prediction – The instruction and caches –Floating point unit –protected mode operation – Segmentation – paging – Protection – multitasking –Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing -Instruction types –Addressing modes – Processor flags – Instruction set - programming the Pentium processor.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE :ARM 9

The ARM architecture – ARM assembly language program – ARM organization and implementation –The ARM instruction set - The thumb instruction set – ARM CPU cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – 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., 2295
2. James L. Antonakos, “The Pentium Microprocessor ‘’ Pearson Education, 2297.
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, 2297.
6. James L.Antonakos, An Introduction to the Intel family of Microprocessors”, PearsonEducation 2299.
7. Barry.B.Breg,” The Intel Microprocessors Architecture , Programming andInterfacing “, PHI, 2002.
8. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001

Readings : Web links: www.ocw.nit.edu,www.arm.com,

LIST OF ELECTIVES

ELECTIVE – VI (SEMESTER III)

ELECTIVE - VI
SEMESTER III

22271E34A SPACE TIME WIRELESS COMMUNICATION **L T P C**
3 0 0 3

AIM:

The aim of this course is to acquire the knowledge on various modulation and coding schemes for space-time WirelessCommunications.

OBJECTIVES:
The students should be made to be

1. To understand transmission and decoding techniques associated with WirelessCommunications.
2. To understand multiple-antenna systems such as multiple-input multiple-output (MIMO)and Space-Time Codes.

UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION 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 CAPACITY OF MULTIPLE ANTENNA CHANNELS 9

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter, Channel known to the transmitter, capacity of random MIMO channels, Influence of ricean fading, fading correlation, XPD and degeneracy on MIMO capacity, Capacity of frequency selective MIMO channels.

UNIT III SPATIAL DIVERSITY 9

Diversity gain, Receive antenna diversity, Transmit antenna diversity, Diversity order and channel variability, Diversity performance in extended channels, Combined space and path diversity, Indirect transmit diversity, Diversity of a space-time- frequency selective fading channel.

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS 9

Coding and interleaving architecture, ST coding for frequency flat channels, ST coding for frequency selective channels, Receivers(SISO,SIMO,MIMO),Iterative MIMO receivers, Exploiting channel knowledge at the transmitter: linear pre-filtering, optimal pre-filtering for maximum rate, optimal pre-filtering for error rate minimization, selection at the transmitter, Exploiting imperfect channel knowledge.

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 9

SISO-OFDM modulation, MIMO-OFDM modulation, Signaling and receivers for MIMOOFDM,SISO-SS modulation, MIMO-SS modulation, Signaling and receivers for MIMO-SS. MIMOMAC, MIMO-BC, Outage performance for MIMO-MU, MIMO-MU with OFDM, CDMA and multiple antennas.

TOTAL : 45 PERIODS

OUTCOMES:

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

- To be able to design and evaluate receiver and transmitter diversity techniques.
- To be able to design and develop OFDM based MIMO systems.
- To be able to calculate capacity of MIMO systems

BOOKS FOR REFERENCES:

1. Andre Viterbi " Principles of Spread Spectrum Techniques" Addison Wesley 2295
2. Jafarkhani, Hamid. Space-time coding: Theory and Practice. Cambridge University Press, 2005.
3. Paulraj, Rohit Nabar, Dhananjay Gore., "Introduction to Space Time Wireless Communication Systems", Cambridge University Press, 2003
4. Sergio Verdu " Multi User Detection" Cambridge University Press, 2298

ELECTIVE - VI
SEMESTER III

22271E34B MEDICAL IMAGING

L T P C
3 0 0 3

AIM:

To study the production of x-rays and its application to different medical Imaging techniques. To study the different types of Radio diagnostic techniques.

OBJECTIVES:

- To study the special imaging techniques used for visualizing the cross sections of the body.
- To study the imaging of soft tissues using ultrasound technique

UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS 8

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II COMPUTER AIDED TOMOGRAPHY 10

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III RADIO ISOTOPIC IMAGING 9

Radiation detectors, Radio isotopic imaging equipment, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV ULTRASONIC SYSTEMS 9

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V MAGNETIC RESONANCE IMAGING 9

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

TOTAL:45 PERIODS

OUTCOMES:

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

- Explain computer aided tomography
- Discuss ultrasonic systems
- Outline magnetic resonance imaging

BOOKS FOR REFERENCES:

1. D.N.Chesney and M.O.ChesneyRadiographic imaging, CBS Publications, New Delhi, 2287.
2. Peggy, W., Roger D.Ferimarch, MRI for Technologists, McGraw Hill, New York, 2295.
3. Steve Webb, The Physics of Medical Imaging, Taylor& Francis, New York.2288.

ELECTIVE - VI
SEMESTER III

22271E34C MOBILE ADHOC NETWORKS L T PC
3 0 0 3

AIM:

The aim of this course is to understand the basics of Ad-hoc & Sensor Networks.

OBJECTIVES:

- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

UNIT I INTRODUCTION 9

Introduction to Ad Hoc networks – definition, characteristics features, applications.Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm,Hierarchical Routing, QoS aware routing.

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 ADHOC FOR 4G 9

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:-Architecture, methods of cooperation, co-operative antennas, Integration of ad hoc networks with other wired and wireless networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Identify different issues in wireless ad hoc and sensor networks.
- To analyze protocols developed for ad hoc and sensor networks.

- To identify and address the security threats in ad hoc and sensor networks.
- Establish a Sensor network environment for different types of applications.

BOOKS FOR REFERENCES:

1. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks Architectures and protocols”, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, “Adhoc Networking”, Addison – Wesley, 2000.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, “Mobile Ad Hoc networking”, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, “The handbook of adhoc wireless networks”, CRC press,2002.
5. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad Hoc Network Research,” Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2,no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , “A survey of integrating IP mobility protocols and Mobile Ad hoc networks”, IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”, Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, ” ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”, World Wireless cong., San Francisco, CA,May 2004.

PRIST DEEMED TO BE UNIVERSITY

Vallam, Thanjavur

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ELECTRONICS & COMMUNICATION ENGINEERING

PROGRAM HANDBOOK

M.TECH - COMMUNICATION SYSTEMS
[PART TIME]

[REGULATION 2022]

M.TECH (PART TIME) - COMMUNICATION SYSTEMS – R-2022

SEMESTER I – VI CURRICULUM

SEMESTER I

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	22248S11BP	Applied Mathematics for Electronics Engineering	3	1	0	4
2	22271C12P	Advanced Digital Signal Processing	3	1	0	4
3	22271C13P	Advanced Digital Communication Techniques	3	1	0	4
Practical						
4	22271L14P	Communication Systems Lab - I	0	0	3	3
					Total	**15**

SEMESTER II

S.N	SUB CODE	SUBJECT	L	T	P	C
Theory						
1	22271C21P	Mobile Communication Networks	4	0	0	4
2	22271C22P	Advanced Microwave Systems	4	0	0	4
3	**22271E23_P**	**Elective-I**	3	0	0	3
Practical						
4	22271L24P	Communication Systems Lab - II	0	0	3	3
5	192TECWRP	Technical Writing /Seminars	0	0	3	3
					Total	**17**

SEMESTER III

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	22271C31P	Electromagnetic Interference and Compatibility	4	0	0	4
2	22271C32P	Advanced Radiation Systems	4	0	0	4
3	**22271E33_P**	**Elective – II**	3	0	0	3
					Total	**11**

SEMESTER IV

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	22271C41P	Wireless Sensor Networks	4	0	0	4
2	22271C42P	Optical Networks	4	0	0	4
3	**22271E43_P**	**Elective-III**	3	0	0	3

Project						
4	22271P44P	Project Work Phase – I	0	0	10	10
					Total	**21**

SEMESTER V

S.N	SUB CODE	SUBJECT	L	T	P	C
	Theory					
1	**22271E51_P**	**Elective-IV**	3	0	0	3
2	**22271E52_P**	**Elective-V**	3	0	0	3
3	**22271E53_P**	**Elective-VI**	3	0	0	3
					Total	**9**

SEMESTER VI

S.N	SUB CODE	SUBJECT	L	T	P	C
1	22271P61P	Project Work Phase – II	0	0	15	15
					Total	**15**
					TOTAL NO. OF CREDITS	**88**

LIST OF ELECTIVES

Elective-I (SEMESTER-II)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E23AP	High Speed Switching Architecture	3	0	0	3
2.	22271E23BP	DSP Processor Architecture and Programming	3	0	0	3
3.	22271E23CP	Digital Speech Processing	3	0	0	3

Elective-II (SEMESTER-III)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E33AP	Internetworking and Multimedia	3	0	0	3
2.	22271E33BP	Digital Image Processing	3	0	0	3
3.	22271E33CP	LASER Communication	3	0	0	3

Elective-III (SEMESTER-IV)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E43AP	Digital Communication Receivers	3	0	0	3
2.	22271E43BP	Soft Computing Techniques	3	0	0	3
3.	22271E43CP	Communication Network Security	3	0	0	3

Elective-IV (SEMESTER-V)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E51AP	Software Defined Radio	3	0	0	3
2.	22271E51BP	Satellite Communication	3	0	0	3
3.	22271E51CP	CDMA Systems	3	0	0	3

Elective-V (SEMESTER-V)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E52AP	Wavelets and Multi Resolution Processing	3	0	0	3
2.	22271E52BP	High Performance Communication Networks	3	0	0	3
3.	22271E52CP	Advanced Microprocessors and Microcontrollers	3	0	0	3

Elective-VI (SEMESTER-V)

S.N	SUB CODE	SUBJECT	L	T	P	C
1.	22271E53AP	Space Time Wireless Communication	3	0	0	3
2.	22271E53BP	Medical Imaging	3	0	0	3
3.	22271E53CP	Mobile ADHOC networks	3	0	0	3

M.TECH (PART TIME) - COMMUNICATION SYSTEMS – R-2019

Course Structure and Credit Distribution

Sem.	Core Courses				Elective Courses		Foundation Courses		Total Credits
	Theory Courses		Practical Courses						
	Nos.	Credits	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	02	08	01	03	-	-	01	04	15
II	02	08	02	06	01	03	-	-	17
III	02	08	-	-	01	03	-	-	11
IV	02	08	01	10	01	03	-	-	21
V	-	-	-	-	03	09	-	-	09
VI	-	-	01	15	-	-	-	-	15
Total Credits									**88**

*RSD-Research Skill Development Courses

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

SEMESTER I

22248S11PB 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 poblems using mathematical tools from a variety of mathematical areas, including fuzzy logic, matrix linear programming, probability, numerical solution of ordinary differential equations and queuing models.

UNIT I CALCULUS OF VARIATIONS 9

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

UNIT II INTEGRAL TRANSFORMS AND WAVE EQUATIONS 9

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

UNIT III LINEAR PROGRAMMING 9

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

UNIT IV RANDOM PROCESS AND QUEUING THEORY 9

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

UNIT V TESTING OF HYPOTHESIS 9

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

Tutorial :15 Total:60

OUTCOMES:

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

- Concepts on vector spaces, linear transformation, inner product spaces, eigenvalues and generalized eigenvectors.

- 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

SEMESTER I

22271C12P ADVANCED DIGITAL SIGNAL PROCESSING L T P C
3 1 0 4

AIM:

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

OBJECTIVES:

- The student comprehends mathematical description and modelling of discrete time random signals.
- The student is conversant with important theorems and random signal processing algorithms.
- The student learns relevant figures of merit such as power, energy, bias and consistency.
- The student is familiar with estimation, prediction, filtering, multirate concepts and techniques.

UNIT I DISCRETE RANDOM SIGNAL PROCESSING 9

Discrete random processes – Ensemble averages – Wide sense stationary process – Properties - Ergodic process – Sample mean & variance - Auto-correlation and Auto-correlation matrices- Properties – White noise process – Weiner Khitchine relation - Power spectral density – Filtering random process – Spectral Factorization Theorem – Special types of Random Processes – AR,MA, ARMA Processes – Yule-Walker equations.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency of estimators - Non-Parametric methods – Periodogram – Modified Periodogram – Barlett’s method – Welch’s mehod – Blackman-Tukey method – Parametric methods – AR, MA and ARMA spectrum estimation - Performance analysis of estimators.

UNIT III SIGNAL MODELING AND OPTIMUM FILTERS 9

Introduction- Least square method – Pade approximation – Prony’s method – Levinson Recursion – Lattice filter - FIR Wiener filter – Filtering – Linear Prediction – Non Causal and Causal IIR Weiner Filter -– Mean square error – Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

FIR Adaptive filters - Newton's steepest descent method – Widrow Hoff LMS Adaptive algorithm – Convergence – Normalized LMS – Applications – Noise cancellation - channel equalization – echo canceller – Adaptive Recursive Filters - RLS adaptive algorithm – Exponentially weighted RLS-sliding window RLS.

UNIT V MULTIRATE SIGNAL PROCESSING 9

Decimation - Interpolation – Sampling Rate conversion by a rational factor I/D – Multistage implementation of sampling rate conversion – Polyphase filter structures – Applications of multirate signal processing.

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 W-K theorem, spectral factorization theorem, spectrum estimation, bias and consistency of estimators.
- Wiener filtering, LMS algorithms, Levinson recursion algorithm, applications of adaptive filters
- Decimation, interpolation, Sampling rate conversion, Applications of multirate signal processing

BOOKS FOR REFERENCES :

1. John G. Proakis, Dimitris G. Manolakis, “Digital Signal Processing”, Prentice Hall of India, New Delhi, 2005.
2. Monson H. Hayes, “Statistical Digital Signal Processing and Modeling”, John Wiley and Sons Inc., New York, 2006.
3. P. P. Vaidyanathan, “Multirate Systems and Filter Banks”, Prentice Hall, 1992.
4. S. Kay,” Modern spectrum Estimation theory and application”, Prentice Hall, Englehood Cliffs, NJ1988.
5. Simon Haykin, “Adaptive Filter Theory”, Prentice Hall, Englehood Cliffs, NJ1986.
6. Sophoncles J. Orfanidis, “Optimum Signal Processing “, McGraw-Hill, 2000.

SEMESTER I

22271C13P MODERN DIGITAL COMMUNICATION SYSTEMS **L T P C**
3 1 0 4

AIM:

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

OBJECTIVES:

- To understand the basics of signal-space analysis and digital transmission.
- 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; MFSK receivers – Rayleigh and Rician channels – Partially coherent receivers – DPSK; M-PSK; M-DPSK-BER Performance Analysis. Carrier Synchronization- Bit synchronization.

UNIT II EQUALIZATION TECHNIQUES 9

Band Limited Channels- ISI – Nyquist Criterion- Controlled ISI-Partial Response signals- Equalization algorithms – Viterbi Algorithm – Linear equalizer – Decision feedback equalization – Adaptive Equalization algorithms

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. Space time block 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 MULTICARRIER AND MULTIUSER COMMUNICATIONS 9

Single Vs multicarrier modulation, orthogonal frequency division multiplexing (OFDM), Modulation and demodulation in an OFDM system, An FFT algorithmic implementation of an OFDM system, Bit and power allocation in multicarrier modulation, Peak-to-average ratio in multicarrier modulation. Introduction to CDMA systems, multiuser detection in CDMA systems – optimum multiuser receiver, suboptimum detectors, successive interference cancellation.

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. Bernard Sklar, “Digital Communications”, second edition, Pearson Education, 2001.
2. John G. Proakis, “Digital Communication”, Fifth Edition, Mc Graw Hill Publication, 2008.
3. M.K.Simon, S.M.Hinedi and W.C.Lindsey, “Digital communication techniques; Signal Design and Detection”, Prentice Hall of India, New Delhi, 1995.
4. Richard Van Nee & Ramjee Prasad, “OFDM for Multimedia Communications” Artech House Publication, 2001.
5. Stephen G. Wilson, “Digital Modulation and Coding”, First Indian Reprint, Pearson Education, 2003.
6. Simon Haykin, “Digital communications”, John Wiley and sons, 1998.
7. Theodore S.Rappaport, ‘Wireless Communications”, 2nd edition, Pearson Education, 2002.

SEMESTER I

22271L14P COMMUNICATION SYSTEM LAB-I L T P C
0 03 3

OBJECTIVES:

- To acquire knowledge on Transmission line and S- parameter estimation of microwave devices.
- 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, 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.

TOTAL:45 PERIODS

OUTCOMES:

Upon the completion of course, students are able to

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

SEMESTER II

22271C21P 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 WIRELESS CHANNEL PROPAGATION AND MODEL 9

Propagation of EM signals in wireless channel–Reflection, diffraction and Scattering-Small scale fading-channel classification-channel models–COST-231 Hata model, Longley-Rice Model,NLOS Multipath Fading Models: Rayleigh, Rician, Nakagami, Composite Fading–shadowingDistributions, Link power budget Analysis

UNIT II OPERATION AND PROPAGATION MODELS AND AIR PROTOCOLS 9

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

UNIT III MOBILE NETWORK ARCHITECTURE 9

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

UNIT IV WIRELESS LOCAL AREA NETWORKS 9

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

UNIT V SECURITY ISSUES IN WIRELESS NETWORKS 9

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

Total:45 Periods

Outcomes :

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

BOOKS FOR REFERENCES :

1. W. Stallings, "Wireless Communications and Networks",Second Edition Prentice Hall, 2007.
2. V.K. Garg, "IS-95 CDMA and CDMA 2000", Prentice Hall PTR, 2000.
3. T.S. Rappaport, "Wireless Communications: Principles & Practice", Second Edition, Prentice Hall,2002.
4. Leon-Garcia and I. Widjaja, "Communication Networks, Fundamental Concepts and 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. UylessBlack ,"Mobile and Wireless Networks" , Prentice Hall PTR, 1996.

SEMESTER II

22271C22P ADVANCEDMICROWAVE 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 INTRODUCTION TO MONOLITHIC MICROWAVE INTEGRATED CIRCUITS 9

Introduction to Monolithic Microwave Integrated Circuits (MMICs), their advantages over discrete circuits, materials, MMIC fabrication techniques, MOSFET fabrication. Thin film formation.

UNIT II MICROSTRIP ANALYSIS 9

Planar transmission lines for MICs. Method of conformal transformation for microstrip analysis, concept of effective dielectric constant, Effective dielectric constant for microstrip, Losses in Microstrip

UNIT III SLOT LINE ANALYSIS 9

Slot Line Approximate analysis and field distribution, Transverse resonance method and evaluation of slot line impedance, comparison with micro strip line.

UNIT IV LUMPED ELEMENTS FOR MICS 9

Lumped Elements for MICs: Use of Lumped Elements, Capacitive elements, Inductive elements and Resistive elements.

UNIT V MICROWAVE SEMICONDUCTOR DEVICES & MICROWAVE PASSIVE COMPONENTS 9

Microwave semiconductor Devices & Microwave passive components Parametric amplifiers, tunnel diode, varactor diode, PIN diode, Gunn diode, their principle of operation, performance characteristics & applications, scattering parameter calculations of E plane-Tee, Magic Tee, Directional Coupler.

Total:45 Periods

OUTCOMES:

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

REFERENCES:

1. Gupta,K.C, and Amarjitsingh "Microwave Integrated Circuits" John Wiley and sons – Wiley Eastern Reprint, 1978.

2. Hoffmann, R.K "Handbook of Microwave Integrated Circuits" Artech House, 1987.

SEMESTER II

22271L24P 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.

LIST OF ELECTIVES

ELECTIVE – I (SEMESTER II)

ELECTIVE -I
SEMESTER II

22271E23AP 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 – non-blocking networks –recursive network – construction and comparison of non-blocking network - switches with deflection routing – shuffle switch - tandem banyan.

UNIT IV MULTIMEDIA COMMUNICATION STANDARDS 9

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

UNIT V IP SWITCHING 9

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

Total:45 Periods

OUTCOMES:

- The student would be able to identify suitable switch architectures for a specified networking scenario and demonstrate its blocking performance.

- 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. AchillePatavina, 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.

ELECTIVE -I
SEMESTER II

22271E23BP DSP PROCESSOR ARCHITECTURE AND PROGRAMMING

L T P C
3 0 0 3

AIM:

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

OBJECTIVES:

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

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

UNIT I FUNDAMENTALS OF PROGRAMMABLE DSPs 9

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

UNIT II TMS320C3X PROCESSOR 9

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

UNIT III ADSP PROCESSORS I 9

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

UNIT IV ADVANCED PROCESSORS 9

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

UNIT VADVANCED PROCESSORS II 9

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

Total:45Periods

OUTCOMES:

Students should be able to:

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

BOOKS FOR REFERENCES :

1. B.Venkataramani and M.Bhaskar, “Digital Signal Processors – Architecture, Programming andApplications” – Tata McGraw – Hill Publishing Company Limited. New Delhi, 2003.

2. User guides Texas Instrumentation, Analog Devices, Motorola.

ELECTIVE -I
SEMESTER II

22271E23CP DIGITAL SPEECH PROCESSING L T P C
3 0 0 3

AIM:

To illustrate the concepts of speech signal representations and coding.

OBJECTIVES:

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

UNIT I MECHANICS OF SPEECH 9

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

UNIT II TIME DOMAIN METHODS FOR SPEECH PROCESSING 9

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

UNIT III FREQUENCY DOMAIN METHOD FOR SPEECH PROCESSING 9

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

UNIT IV LINEAR PREDICTIVE ANALYSIS OF SPEECH 9

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

UNIT V APPLICATION OF SPEECH & AUDIO SIGNAL PROCESSING 9

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

Total:45 Periods

OUTCOMES:

Students will be able to:

- Model speech production system and describe the fundamentals of speech.
- Extract and compare different speech parameters.

- 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

22271CRMP 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

22271C31P ELECTROMAGNETIC INTERFERENCE AND COMPATIBILITY

L	T	P	C
4	0	0	4

OBJECTIVES:

- The basics of EMI
- EMI sources.
- EMI problems.
- Solution methods in PCB.
- Measurements techniques for emission.
- Measurement techniques for immunity.

UNIT I BASIC THEORY 9

Introduction to EMI and EMC, Intra and inter system EMI, Elements of Interference, Sources and Victims of EMI, Conducted and Radiated EMI emission and susceptibility, Case Histories, Radiation hazards to humans, Various issues of EMC, EMC Testing categories EMC Engineering Application.

UNIT II COUPLING MECHANISM 9

Electromagnetic field sources and Coupling paths, Coupling via the supply network, Common mode coupling, Differential mode coupling, Impedance coupling, Inductive and Capacitive coupling, Radioactive coupling, Ground loop coupling, Cable related emissions and coupling, Transient sources, Automotive transients.

UNIT III EMI MITIGATION TECHNIQUES 9

Working principle of Shielding and Murphy‟s Law, LF Magnetic shielding, Apertures and shielding effectiveness, Choice of Materials for H, E, and free space fields, Gasketting and sealing, PCB Level shielding, Principle of Grounding, Isolated grounds, Grounding strategies for Large systems, Grounding for mixed signal systems, Filter types and operation, Surge protection devices, Transient Protection.

UNIT IV STANDARD AND REGULATION 9

Need for Standards, Generic/General Standards for Residential and Industrial environment, Basic Standards, Product Standards, National and International EMI Standardizing Organizations; IEC, ANSI, FCC, AS/NZS, CISPR, BSI, CENELEC, ACEC. Electro Magnetic Emission and susceptibility standards and specifications, MIL461E Standards.

UNIT V EMI TEST METHODS AND INSTRUMENTATION 9

Fundamental considerations, EMI Shielding effectiveness tests, Open field test, TEM cell for immunity test, Shielded chamber , Shielded anechoic chamber, EMI test receivers, Spectrum analyzer, EMI test wave simulators, EMI coupling networks, Line impedance stabilization networks, Feed through capacitors, Antennas, Current probes, MIL -STD test methods, Civilian STD test methods.

Total:45 Periods

COURSE OUTCOMES:

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

- Identify Standards
- Compare EMI test methods
- Discuss EMI mitigation techniques

BOOKS FOR REFERENCES :

1. Bemhard Keiser, "Principles of Electromagnetic Compatibility", 3rd Ed, Artech house, Norwood, 1986.
2. Clayton Paul, "Introduction to Electromagnetic Compatibility", Wiley Interscience, 2006.
3. Daryl Gerke and William Kimmel, "EDN‟s Designer‟s Guide to Electromagnetic Compatibility", Elsevier Science & Technology Books, 2002
4. Dr Kenneth L Kaiser, "The Electromagnetic Compatibility Handbook", CRC Press 2005.
6. Electromagnetic Compatibility by Norman Violette ,Published by Springer, 2013
7. Electromagnetic Interference and Compatibility: Electrical noise and EMI specifications Volume 1 of A Handbook Series on Electromagnetic Interference and Compatibility, Donald R. J. White Publisher-Don white consultants Original from the University of Michigan Digitized 6 Dec 2007
8. Henry W. Ott, "Electromagnetic Compatibility Engineering", John Wiley & Sons Inc, Newyork, 2009
9. V Prasad Kodali, "Engineering Electromagnetic Compatibility", IEEE Press, Newyork, 2001.
10. W Scott Bennett, "Control and Measurement of Unintentional Electromagnetic Radiation", John Wiley & Sons Inc., (Wiley Interscience Series) 1997.

SEMESTER III

22271C32P 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 I ANTENNA FUNDAMENTALS 9

Antenna fundamental parameters, Radiation integrals ,Radiation from surface and line current distributions – dipole, monopole, loop antenna; Mobile phone antenna- base station, handset antenna; Image; Induction ,reciprocity theorem, Broadband antennas and matching techniques, Balance to unbalance transformer, Introduction to numerical techniques.

UNIT II RADIATION FROM APERTURES 9

Field equivalence principle, Radiation from Rectangular and Circular apertures, Uniform aperture distribution on an infinite ground plane; Slot antenna; Horn antenna; Reflector antenna, aperture blockage, and design consideration.

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 Fraunhofer and Fresnel diffraction.Complimentary screens and slot antennas. Slot and dipoles as dual antennas. Fourier transform of 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 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

LIST OF ELECTIVES

ELECTIVE – II (SEMESTER III)

ELECTIVE -II
SEMESTER III

22271E33AP INTERNETWORKING AND MULTIMEDIA L T P C
3 0 0 3

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 subject, students will be able to:

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

BOOKS FOR REFERENCES :

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

ELECTIVE -II
SEMESTER III

22271E33BP DIGITAL IMAGE PROCESSING L T P C
3 0 0 3

AIM:

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

OBJECTIVES:

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

UNIT I DIGITAL IMAGE FUNDAMENTALS 9

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

UNIT II IMAGE TRANSFORMS 9

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

UNIT III ENHANCEMENT AND RESTORATION 9

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

UNIT IV IMAGE SEGMENTATION AND RECOGNITION 9

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

UNIT V IMAGE COMPRESSION 9

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

Total:45 Periods

OUTCOMES:

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

- Explain the fundamentals of digital image processing.

- 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, PearsonEducation Inc., 2004.
2. Anil K. Jain, ‘Fundamentals of Digital Image Processing’, Prentice Hall of India, 2002.
3. David Salomon , “Data Compression The Complete Reference”, 2nd Edition, SpringerVerlag , New York Inc., 2001.
4. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education, Inc., 2004.
5. William K. Pratt, “Digital Image Processing”, John Wiley, NewYork, 2002.
6. MilmanSonka, Vaclav Hlavac, Roger Boyle, “Image Processing Analysis and Machine Vision”, 2nd edition, Brooks/Cole, Vikas Publishing House, 1999.

ELECTIVE -II
SEMESTER III

22271E33CP LASER COMMUNICATION L T P C
3 0 0 3

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

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

UNIT I LASER COMMUNICATIONS 9
Atmospheric low loss windows, optical sources and detectors for these windows, Characteristics of source and detectors. Optical transmitting and receiving antennas.

UNIT II SYSTEM DESIGN 9
Link equation, Transmitter terminal, Antenna design, Antenna gain, Beam width, C/N, Optical detectors, Optical modulation formats, Deriving error statistics, Signal requirements for acquisition and tracking, Fundamentals of system design.

UNIT III SEMICONDUCTOR AND METAL LASER SOURCES FOR SATELLITE COMMUNICATIONS 9
Performance and Geometries, output wavelength control, Semiconductor laser lifetime, Direct and indirect modulation techniques and radiation effects.

UNIT IV OPTICAL RECEIVERS AND SYSTEM DESIGN 9
Direct detection, coherent detection and demodulation. Gimbals in transceiver design, Receiver options and optics; Lasers; antennas / Telescope, Internal optical systems, Transmitter analysis.

UNIT V LASER BEAM POINTING CONTROL 9
Acquisition and Tracking systems, System description, Acquisition methodology, racking and pointing control system, RF cross link system design, link equation.

Total:45 Periods

Outcomes:
Students are able to
- Recognize and classify the structures of Optical fiber and types.
- Discuss the channel impairments like losses and dispersion.
- Analyze various coupling losses.
- Classify the Optical sources and detectors and to discuss their principle.
- Familiar with Design considerations of fiber optic systems.
- To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.

BOOKS FOR REFERENCES :

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

SEMESTER IV

22271C41P 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 SensorNetworks.

UNIT II ARCHITECTURES 9

Single-Node Architecture - Hardware Components, Energy Consumption of SensorNodes , Operating Systems and Execution Environments, Network Architecture -Sensor Network Scenarios, Optimization Goals and Figures of Merit, GatewayConcepts.

UNIT III NETWORKING SENSORS 10

Physical Layer and Transceiver Design Considerations, MAC Protocols for WirelessSensor Networks, Low Duty Cycle Protocols and Wake Up Concepts - S-MAC , TheMediation Device Protocol, Wake Up Radio Concepts, Address and Name Management,Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing,Geographic Routing.

UNIT IV INFRASTRUCTURE ESTABLISHMENT 9

Topology Control, Clustering, Time Synchronization, Localization and Positioning,Sensor Tasking and Control.

UNIT V SENSOR NETWORK ARCHITECTUREAND MAC PROTOCOLS 9

Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks. , physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management - MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error control, framing, link management.

TOTAL- 45 PERIODS

OUTCOMES:

- Familiar with the latest 4G networks and LTE
- Understand about the wireless IP architecture and LTE network architecture.
- Familiar with the adaptive link layer and network layer graphs and protocol.
- Understand about the mobility management and cellular network.
- Understand about the wireless sensor network architecture and its concept.

BOOKS FOR REFERENCES:

1. Holger Karl & Andreas Willig, " Protocols And Architectures for Wireless Sensor Networks" , John Wiley, 2005.
2. Feng Zhao & Leonidas J. Guibas, “Wireless Sensor Networks- An Information Processing Approach", Elsevier, 2007.
3. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks- Technology, Protocols, And Applications”, John Wiley, 2007.
4. Anna Hac, “Wireless Sensor Network Designs”, John Wiley, 2003.

SEMESTER IV

22271C42P OPTICAL NETWORKS 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 INTRODUCTION TO OPTICAL NETWORKS 9

Telecommunications Networks Architecture, Services, circuit switching and packet switching, Optical Networks: Multiplexing Techniques, Second generation Optical Networks, Optical Packet Switching, Transmission Basics: Wavelength, frequencies, and channel spacing, Wavelength standards, Optical power and loss, Network Evolution, Nonlinear Effects: Self-phase Modulation, Cross-phase Modulation, Four Wave mixing, Solitons. Components: Couplers, Isolators and Circulators, Multiplexers and Filters, Optical Amplifiers, Transmitters, Detectors, Switches, Wavelength Converters.

UNIT II TRANSMISSION SYSTEM ENGINEERING 9

System Model, Power Penalty, Transmitter, Receiver, Optical Amplifiers, Crosstalk, Dispersion, Wavelength Stabilization, Overall Design Considerations. Optical Internets: Migration to IP optical networking, IP and Optical backbone, IP Routing table, MPLS and optical cross connect table, Protocol stack Alternatives, Internetworking SS7 and Legacy Transport, Internet transport network protocol stack.

UNIT III SONET, SDH AND OPTICAL TRANSPORT NETWORKS (OTNS) 9

SONET and SDH: SONET multiplexing hierarchy, Frame structure, Functional Component, problem detection, concatenation. Architecture of Optical Transport Networks (OTNs): Digital wrapper, in-band and out-of band control signalling, Importance of Multiplexing and multiplexing hierarchies, SONET multiplexing hierarchies, SDH multiplexing hierarchies, New Optical Transport, OTN layered Model, Generic Framing Procedure (GFP)

UNIT IV WDM, NETWORK TOPOLOGIES, MPLS AND OPTICAL NETWORKS 9

WDM: WDM operation, Dense Wavelength Division Multiplexing (DWDM), Erbium-doped Fiber (EDF), WDM amplifiers, Add-Drop Multiplexers, Wavelength Continuity Property, Higher dispersion for DWDM, Tunable DWDM Lasers.

UNIT V NETWORK TOPOLOGIES AND PROTECTION SCHEMES 9

Robust networks, Line and path protection switching, Types of topology, Point to point topology, bi-directional line-switched ring (BLSR), meshed topology, Passive optical networks, Metro optical networks 28 MPLS and Optical Networks: IS label switching, Forwarding equivalence class (FEC), Types of MPLS nodes, Label distribution and binding, label swapping and traffic forwarding, MPLS support of Virtual Private Networks (VPN), MPLS traffic engineering, Multi protocol Lambda switching (MPIS).

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 – Practical Perspective", 3rd Edition, Morgan - Kaufmann Publishers.
2. Optical Networks, Third Generation Transport Systems, Uyless Black, Pearson

LIST OF ELECTIVES

ELECTIVE – III (SEMESTER IV)

ELECTIVE -III
SEMESTER IV

22271E43AP DIGITAL COMMUNICATION RECEIVERS L T P C
3 0 0 3

AIM:

The aim of this course is to understand the basic principles of digital communication techniques.

OBJECTIVES:

- To understand the basic principles of digital communication techniques.
- To gain knowledge about receivers for AWGN channel and Fading channels.
- To understand the concepts of synchronization and adaptive equalization techniques.

UNIT I REVIEW OF DIGITAL COMMUNICATION TECHNIQUES 9

Baseband and bandpass communication, signal space representation, linear and non- linear modulation techniques, and spectral characteristics of digital modulation.

UNIT II OPTIMUM RECEIVERS FOR AWGN CHANNEL 9

Correlation demodulator, matched filter, maximum likelihood sequence detector, Optimum receiver for CPM signals, M-ary orthogonal signals, envelope detectors for M-ary and correlated binary signals.

UNIT III RECEIVERS FOR FADING CHANNELS 9

Characterization of fading multiple channels, statistical models, slow fading, frequency selective fading, diversity technique, RAKE demodulator, coded waveform for fading channel

UNIT IV SYNCHRONIZATION TECHNIQUES 9

Carrier and symbol synchronization, carrier phase estimation – PLL, Decision directed loops, symbol timing estimation, maximum likelihood and non-decision directed timing estimation, joint estimation.

UNIT V ADAPTIVE EQUALIZATION 9

Zero forcing algorithm, LMS algorithm, Adaptive decision – feedback equalizer, and equalization of Trellis-coded signals, Kalman algorithm, blind equalizers, and stochastic gradient algorithm, Echo cancellation

Total:45 Periods

OUTCOMES:

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

- Apply basic principles of digital communication techniques.
- Discuss on receivers for AWGN & Fading channel

- Describe various synchronization techniques.
- Design adaptive equalization algorithms to satisfy the evolving demands in digital communication.

BOOKS FOR REFERENCES :

1. Heinrich Meyer, Mare Moeneclacy and Stefan.A. Fechtel, “Digital Communication Receivers”, VolI&II, John Wiley, New York, 1997
2. John. G. Proakis, “Digital Communication”, 4th ed., McGraw Hill, New York, 2001
3. E.A. Lee and D.G. Messerschmitt, “Digital Communication”, 2nd edition, Allied Publishers, NewDelhi, 1994
4. Simon Marvin, “Digital Communication Over Fading channel; An unified approach to performanceAnalysis”, John Wiley, New York, 2000
5. Bernard Sklar, “Digital Communication Fundamentals and Applications, Prentice Hall, 1998

ELECTIVE -III
SEMESTER IV

22271E43BP SOFT COMPUTING TECHNIQUES L T P C
3 0 0 3

OBJECTIVES:

- To know the basics of artificial neural networks
- 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 algorithm
- To provide adequate knowledge about the applications of Soft Computing.

UNIT I ARTIFICIAL NEURAL NETWORK 9

Introduction-Basic concepts of Neural Network-Model of an Artificial Neuron-Characteristics of Neural Network-Learning Methods-Backpropagation Network Architecture-Backpropagation Learning-Counter Propagation Network-Hopfield/Recurrent Network-Adaptive Resonance Theory.

UNIT II FUZZY LOGIC 9

Basic concepts of Fuzzy Logic-Fuzzy Sets and Crisp Sets-Fuzzy Set Theory and Operations-Properties of Fuzzy Sets-Fuzzy and Crisp relations, Fuzzy to Crisp Conversion-Membership Functions-Interference in Fuzzy Logic-Fuzzy if-then Rules, Fuzzy implications and Fuzzy Algorithms,Fuzzification & Defuzzification-Fuzzy Controller.

UNIT III NEURO-FUZZY MODELLING 9

ANFIS Architecture-Classification and Regression Trees-Data Clustering algorithms-Rulebase Structure Identification.

UNIT IV GENETIC ALGORITHMS 9

Basic concepts-Working Principle-Inheritance Operators-Cross Over-Inversion & Deletion-Mutation Operator-Generation Cycle.

UNIT V APPLICATIONS OF SOFTCOMPUTING 9

Genetic Algorithm Application- Bagley and Adaptive Game-Playing Program- Greg Viols Fuzzy Cruise Controller-Air Conditioner Controller-Application of Back Propagation Neural Network.

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. George J. Klir and Bo Yuan, ‘Fuzzy Sets and Fuzzy Logic Theory and Applications’, Printice Hall of India, 2002.
2. J.S.R.Jang,C.T.Sun and E.Mizutani,"Neuro-Fuzzy and Soft Computing",PHI,2004, Pearson Education 2004.

3. Laurene Fausett,"Fundamentals of Neural Networks: Architectures, Algorithms and Applications", Pearson Education India, 2006.
4. S.Rajasekaran and G.A.V.Pai."Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2010.
5. Timothy J Ross, "Fuzzy logic with Engineering Applications", John Wiley and Sons, 2009.
6. Zimmermann H.J."Fuzzy Set Theory and Its Application" Springer International Edition, 2011.

ELECTIVE -III
SEMESTER IV

22271E43CP COMMUNICATION NETWORK SECURITY L T P C
3 00 3

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 Countermeasures; 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

LIST OF ELECTIVES

ELECTIVE – IV (SEMESTER V)

ELECTIVE -IV
SEMESTER V

22271E51AP **SOFTWARE DEFINED RADIO** **L T P C**
3 0 0 3

AIM:

The aim of this course is to understand the concepts of software defined radio.

OBJECTIVES:

The students should be made to be

- Understand the concepts of software defined radio
- Learn spectrum sensing and dynamic spectrum access

UNIT I: Introduction to SDR **9**

The Need for Software Radios-Characteristics and Benefits of a Software Radio. Design Principles of a Software Radio.Radio frequency implementation issues-The Purpose of the RF Front-End. Dynamic Range: The Principal Challenge of Receiver Design. RF Receiver Front-End Topologies. Enhanced Flexibility of the RF Chain with Software Radios. Importance of the Components -Transmitter Architectures and their Issues. Noise and Distortion in the RF Chain. ADC and DAC Distortion.

UNIT II :Direct Digital Synthesis **9**

Introduction. Comparison of Direct Digital Synthesis with Analog Signal Synthesis. Approaches to Direct Digital Synthesis. Analysis of Spurious Signals. Spurious Components due to Periodic Jitter. Band pass Signal Generation. Performance of Direct Digital Synthesis Systems. Hybrid DDS-PLL Systems. Applications of direct Digital Synthesis. Generation of Random Sequences. ROM Compression Techniques.

UNIT III Signal Processor and Multi Rate Processing Techniques **9**

Introduction. Sample Rate Conversion Principles. Polyphase Filters. Digital Filter Banks. Timing Recovery in Digital Receivers Using Multirate Digital Filters.

DSP Processors; Field Programmable Gate Arrays; Trade-Offs in Using DSPs, FPGAs, and ASICs; Power Management Issues; Using a Combination of DSPs, FPGAs, and ASICs.

UNIT IV: Smart Antennas **9**

Vector channel modeling; Benefits of smart antennas; Structures for Beam forming Systems; Smart Antenna Algorithms.Diversity and Space-Time Adaptive Signal Processing; Algorithms for Transmit STAP; Hardware Implementation of Smart Antennas; Array Calibration.

UNIT V: Applications –Wireless Aspects of Tele-Health Care **9**

The application of advanced telecommunication , the special requirements especially related to reliability, privacy and trust, Regulatory and safety aspects of tele-health care, Cognitive radio and flexible spectrum usage for tele-healthcare, Cooperative Communications for Tele-health. Case studies: JTRS radio system ,Software defined base stations.

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

ELECTIVE -IV
SEMESTER V

22271E51BP SATELLITE COMMUNICATION L T P C
3 0 0 3

AIM:

To understand the basics of satellite orbits.To understand the satellite segment and earth segment.

OBJECTIVES:

The students should be made to be

- Learn M2M developments and satellite applications
- Understand Satellite Communication In Ipv6 Environment

UNIT I ORBITAL MECHANICS 9

Kepler's laws of motion, Orbits, Orbit Equations, Orbit Description, Locating the Satellite in the Orbit and with Respect to Earth, Orbital Elements-Look Angle Determination and Visibility - Orbital Perturbations,Orbit Determination, Launch Vehicles, Orbital Effects in Communication System - Performance Attitude control; Satellite launch vehicles. spectrum allocations for satellite systems.

UNIT II SPACECRAFT SUBSYSTEMS AND EARTH STATION 9

Spacecraft Subsystems, Altitude and Orbit Control, Telemetry and Tracking, Power Systems,Communication Subsystems, Transponders, Antennas, Equipment Reliability, Earth Stations, Example of payloads of operating and planned systems.

UNIT III SPACE LINKS 9

The Space Link, Satellite Link Design - Satellite uplink -down link power Budget, Basic Transmission Theory, System Noise Temp, G/T Ratio, Noise Figure, Downlink Design, Design of Satellite Links for Specified C/N - Microwave Propagation on Satellite-Earth Paths. Interference between satellite circuits, Energy Dispersal, propagation characteristics of fixed and mobile satellite links.

UNIT IV MULTIPLE ACCESS TECHNIQUES AND NETWORK ASPECTS 9

Single access vs. multiple access (MA). Classical MA techniques: FDMA, TDMA. Single channel per carrier (SCPC) access - Code division multiple access (CDMA). Demand assignment techniques. Examples of MA techniques for existing and planned systems (e.g. the satellite component of UMTS).Mobile satellite network design, ATM via satellite. TCP/IP via satellite - Call control, handover and call set up procedures.
Hybrid satellite-terrestrial networks

UNIT V SERVICES AND APPLICATIONS 9

Fixed and mobile services - Multimedia satellite services - Advanced applications based on satellite platforms - INTELSAT series - INSAT, VSAT, Remote Sensing - Mobile satellite service: GSM. GPS,INMARSAT, Navigation System, Direct to Home service (DTH), Special services, E-mail, Videoconferencing and Internet connectivity

OUTCOMES:

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

- Discuss satellite navigation and global positioning system
- Outline deep space networks and inter planetary missions

BOOKS FOR REFERENCES:

1. Dennis Roddy, “Satellite Communications”, 3rd Edition, McGraw Hill International Editions, 2001
2. Bruce R.Elbert, “Introduction to Satellite Communication” ,Artech House Inc.,1999.
3. Timothy Pratt, Charles W. Bostian, Jeremy Allnutt, “Satellite Communications”, 2nd Edition, Wiley, John& Sons, 2002
4. Wilbur L.Pritchard, HendriG.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.

ELECTIVE -IV
SEMESTER V

22271E51CP **CDMA SYSTEMS** **L T P C**
3 0 0 3

AIM:

The aim of this course is to define the basics of cellular communications and explain the Architecture OF GSM & its Radio Channels.

OBJECTIVES:

The students should be made to be

- understand cellular concept, widely popular 2G digital, TDMA based mobile system GSM and modern mobile wireless system CDMA.

UNIT I BASIC CONCEPTS OF CDMA **9**

Spread spectrum communication techniques (DS-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 & demodulationprocess , Handoff and power control in 3G systems.

UNIT IV MULTICARRIER CDMA SYSTEMS **9**

Multicarrier CDMA, System design , Performance parameters – BER lower bound,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V OPTICAL CDMA **9**

Prime Codes and it’s properties, Generalized and Extended Prime Codes,Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multi wavelength Optical CDMA networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Analyze MIMO system.
- Discuss millimeter wave communication.
- Demonstrate software defined radio and cognitive radio.

BOOKS FOR REFERENCES:

1. John G.Proakis, “Digital Communications”, McGraw Hill International Ltd,4th ed., Singapore, 2000.
2. Andrew J. Viterbi, “ CDMA: Principles of Spread Spectrum Communication”,Addison- Wesley, 1sted. , 1995.

3. KavethPahlavan,. K. PrashanthKrishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
4. Vijay Kumar Garg, “IS –95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation”, Pearson Education , 2st ed. , 2003.
5. Richard Van Nee, Ramjee Prasad, ” OFDM for Wireless Multimedia Communication” , Artech House , Boston ,London, 2000.
6. Andreas F. Molisch, “Wireless Communication”, Wiley India, 2006.
7. Raymond Steele, Chin-Chun Lee, Peter Gould, “GSM CDMA One and 3GSystems”, Wiley India, 2004.
8. Guu-Chang Yang, “Prime Codes with Application to Optical and Wireless Networks”, Artech House, Inc., 2002.

LIST OF ELECTIVES

ELECTIVE – V (SEMESTER V)

ELECTIVE - V
SEMESTER V

22271E52AP WAVELETS AND MULTIRESOLUTION PROCESSING

L T P C
3 0 0 3

AIM:

To introduce the fundamentals concepts of wavelet transforms.

OBJECTIVE:

- To study system design using Wavelets
- To learn the different wavelet families & their applications.

UNIT I INTRODUCTION 9

Vector Spaces - properties - dot product - basis - dimension, orthogonality and orthonormality - relationship between vectors and signals - Signal spaces - concept of Convergence – GeneralisedFourier Expansion.

UNIT II MULTI RESOLUTION ANALYSIS 9

Definition of Multi Resolution Analysis (MRA) – Haar basis - Construction of general orthonormal MRA Wavelet basis– Continuous time MRA interpretation for the DTWT – Discrete time MRA- Basis functions for the DTWT – PR-QMF filter banks

UNIT III CONTINUOUS WAVELET TRANSFORM 9

Wavelet Transform - definition and properties - concept of scale and its relation with frequency - Continuous Wavelet Transform (CWT) - Scaling function and wavelet functions (Daubechies, Coiflet,Mexican Hat, Sinc, Gaussian, Bi-Orthogonal) - Tiling of time -scale plane for CWT.

UNIT IV DISCRETE WAVELET TRANSFORM 9

Filter Bank and sub band coding principles - Wavelet Filters - Inverse DWT computation by Filterbanks -Basic Properties of Filter coefficients - Choice of wavelet function coefficients - Derivations of Daubechies Wavelets - Multi-band Wavelet transforms. Introduction to lifting Scheme

UNIT V APPLICATIONS 9

Signal Compression – Image Compression techniques: EZW-SPHIT Coding - Image denoisingtechniques:Noise estimation - Shrinkage rules -. Shrinkage Functions - Edge detection and object Isolation, Image Fusion, and Object Detection.

TOTAL : 45 PERIODS

OUTCOME:

- The students will be able to apprehend the detailed knowledge about the Wavelet transform & its applications.

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)

ELECTIVE - V
SEMESTER V

22271E52BP HIGH PERFORMANCE COMMUNICATION NETWORKS

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

AIM:

To familiarize concepts and terminology associated with ATM, Frame Relay, MPLS, Bluetooth technology**.**

OBJECTIVES:

- To appreciate the need for interoperable network management as a typical distributed application
- To be aware of current trends in network technologies

UNIT I PACKET SWITCHED NETWORKS 9

OSI and IP models, Ethernet (IEEE 802.3), Token ring (IEEE 802.5), Wireless LAN (IEEE 802.11) FDDI,DQDB, SMDS: Internetworking with SMDS

UNIT II ISDN AND BROADBAND ISDN 9

ISDN - overview, interfaces and functions, Layers and services - Signaling System 7 (SS7)- Broadband ISDN architecture and Protocols.

UNIT III ATM AND FRAME RELAY 9

ATM: Main features-addressing, signaling and routing, ATM header structure-adaptation layer, management and control, ATM switching and transmission.
Frame Relay: Protocols and services, Congestion control, Internetworking with ATM, Internet and ATM, Frame relay via ATM.

UNIT IV ADVANCED NETWORK ARCHITECTURE 9

IP forwarding architectures overlay model, Multi Protocol Label Switching (MPLS), integrated services in the Internet, Resource Reservation Protocol (RSVP), Differentiated services

UNIT V BLUETOOTH TECHNOLOGY 9

The Bluetooth module-Protocol stack Part I: Antennas, Radio interface, Base band, The Link controller, Audio, The Link Manager, The Host controller interface; The Bluetooth module-Protocol stack Part I:Logical link control and adaptation protocol, RFCOMM, Service discovery protocol, Wireless access protocol, Telephony control protocol.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Diagnose problems and make minor repairs to computer networks using appropriate diagnostics software
- Demonstrate how to correctly maintain LAN computer systems
- Maintain the network by performing routine maintenance tasks
- Apply network management tools

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. SumitKasera, PankajSethi, “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 PravinVaraiya ,”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.

ELECTIVE - V
SEMESTER V

22271E52CP ADVANCED MICROPROCESSORS AND MICROCONTROLLERS

L T P C
3 0 0 3

AIM:

To introduce the advanced features in microprocessors and microcontrollers.

OBJECTIVES:

- To enable the students to understand various microcontroller architectures
- To expose the students to the fundamentals of microprocessor architecture.

UNIT I MICROPROCESSOR ARCHITECTURE 9

Instruction set – Data formats – Instruction formats – Addressing modes – Memory hierarchy – register file – Cache – Virtual memory and paging – Segmentation – Pipelining – The instruction pipeline –pipeline hazards – Instruction level parallelism – reduced instruction set – Computer principles – RISC versus CISC – RISC properties – RISC evaluation – On-chip register files versus cache evaluation

UNIT II HIGH PERFORMANCE CISC ARCHITECTURE – PENTIUM 9

The software model – functional description – CPU pin descriptions – RISC concepts – bus operations – Super scalar architecture – pipelining – Branch prediction – The instruction and caches –Floating point unit –protected mode operation – Segmentation – paging – Protection – multitasking –Exception and interrupts – Input /Output – Virtual 8086 model – Interrupt processing -Instruction types –Addressing modes – Processor flags – Instruction set - programming the Pentium processor.

UNIT III HIGH PERFORMANCE RISC ARCHITECTURE :ARM 9

The ARM architecture – ARM assembly language program – ARM organization and implementation –The ARM instruction set - The thumb instruction set – ARM CPU cores.

UNIT IV MOTOROLA 68HC11 MICROCONTROLLERS 9

Instructions and addressing modes – operating modes – Hardware reset – Interrupt system – 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”, PearsonEducation 1999.
7. Barry.B.Breg,” The Intel Microprocessors Architecture , Programming andInterfacing “, PHI, 2002.
8. Valvano "Embedded Microcomputer Systems" Thomson Asia PVT LTD first reprint 2001

Readings : Web links: www.ocw.nit.edu,www.arm.com,

LIST OF ELECTIVES

ELECTIVE – VI (SEMESTER V)

ELECTIVE - VI
SEMESTER V

22271E53AP SIMULATION OF COMMUNICATION NETWORKS

L T P C
3 0 0 3

OBJECTIVES:
The students should be made to be

- To acquire the knowledge on various modulation and coding schemes for space-time Wireless Communications.
- To understand transmission and decoding techniques associated with Wireless Communications.
- To understand multiple-antenna systems such as multiple-input multiple-output (MIMO) and Space-Time Codes.

UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION 9
Wireless channel, Scattering model in macrocells, Channel as a ST random field, Scattering functions, Polarization and field diverse channels, Antenna array topology, Degenerate channels, reciprocity and its implications, Channel definitions, Physical scattering model, Extended channel models, Channel measurements, sampled signal model, ST multiuser and ST interference channels, ST channel estimation.

UNIT II CAPACITY OF MULTIPLE ANTENNA CHANNELS 8
Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter, Channel known to the transmitter, capacity of random MIMO channels, Influence of ricean fading, fading correlation, XPD and degeneracy on MIMO capacity, Capacity of frequency selective MIMO channels.

UNIT III SPATIAL DIVERSITY 8
Diversity gain, Receive antenna diversity, Transmit antenna diversity, Diversity order and channel variability, Diversity performance in extended channels, Combined space and path diversity, Indirect transmit diversity, Diversity of a space-time- frequency selective fading channel.

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS 10
Coding and interleaving architecture, ST coding for frequency flat channels, ST coding for frequency selective channels, Receivers(SISO,SIMO,MIMO),Iterative MIMO receivers, Exploiting channel knowledge at the transmitter: linear pre-filtering, optimal pre-filtering for maximum rate, optimal pre-filtering for error rate minimization, selection at the transmitter, Exploiting imperfect channel knowledge.

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 10

SISO-OFDM modulation, MIMO-OFDM modulation, Signaling and receivers for MIMOOFDM,SISO-SS modulation, MIMO-SS modulation, Signaling and receivers for MIMO- SS. MIMOMAC, MIMO-BC, Outage performance for MIMO-MU, MIMO-MU with OFDM, CDMA and multiple antennas.

TOTAL : 45 PERIODS

OUTCOMES:

- To be able to design and evaluate receiver and transmitter diversity techniques.
- To be able to design and develop OFDM based MIMO systems.
- To be able to calculate capacity of MIMO systems.

BOOKS FOR REFERENCES:

1. Andre Viterbi " Principles of Spread Spectrum Techniques" Addison Wesley 1995.
2. Jafarkhani, Hamid. Space-time coding: Theory and Practice. Cambridge University Press, 2005.
3. Paulraj, Rohit Nabar, Dhananjay Gore., "Introduction to Space Time Wireless Communication Systems", Cambridge University Press, 2003
4. Sergio Verdu " Multi User Detection" Cambridge University Press, 1998

ELECTIVE - VI
SEMESTER V

22271E53BP MEDICAL IMAGING L T P C
3 0 0 3

AIM:

To study the production of x-rays and its application to different medical Imaging techniques. To study the different types of Radio diagnostic techniques.

OBJECTIVES:

- To study the special imaging techniques used for visualizing the cross sections of the body.
- To study the imaging of soft tissues using ultrasound technique

UNIT I PRINCIPLES OF RADIOGRAPHIC EQUIPMENTS 8

X-Ray tubes, cooling systems, removal of scatters, construction of image Intensifier tubes, angiographic setup, digital radiology.

UNIT II COMPUTER AIDED TOMOGRAPHY 10

Need for sectional images, Principles of sectional scanning, Method of convolution and Back-Propagation, Methods of reconstruction, Artifacts, Principle of 3D imaging

UNIT III RADIO ISOTOPIC IMAGING 9

Radiation detectors, Radio isotopic imaging equipment, scanners, Principle of semiconductor detectors, Gamma ray camera, Positron Emission tomography. SPECT.

UNIT IV ULTRASONIC SYSTEMS 9

Wave propagation and interaction in Biological tissues, Acoustic radiation, continuous and pulsed excitation, Transducers and imaging systems, Scanning methods, Principle of image generation.

UNIT V MAGNETIC RESONANCE IMAGING 9

Principles of MRI, Relaxation processes and their measurements, Pulse sequencing and MR image acquisition.

TOTAL:45 PERIODS

OUTCOMES:

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

- Explain computer aided tomography
- Discuss ultrasonic systems
- Outline magnetic resonance imaging

BOOKS FOR REFERENCES:

1. D.N.Chesney and M.O.ChesneyRadiographic 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.

ELECTIVE - VI
SEMESTER V

22271E53CP MOBILE AD HOC NETWORKS L T P C
3 0 0 3

AIM:

The aim of this course is to understand the basics of Ad-hoc & Sensor Networks.

OBJECTIVES:

- To learn various fundamental and emerging protocols of all layers.
- To study about the issues pertaining to major obstacles in establishment and efficient management of Ad-hoc and sensor networks.
- To understand the nature and applications of Ad-hoc and sensor networks.
- To understand various security practices and protocols of Ad-hoc and Sensor Networks.

UNIT I INTRODUCTION 9

Introduction to Ad Hoc networks – definition, characteristics features, applications. Characteristics of Wireless channel, Adhoc Mobility Models: - entity and group models.

UNIT II MEDIUM ACCESS PROTOCOLS 9

MAC Protocols: design issues, goals and classification. Contention based protocols, reservation based protocols, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN.

UNIT III NETWORK PROTOCOLS 9

Addressing issues in ad hoc network, Routing Protocols: Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Power/ Energy aware routing algorithm,Hierarchical Routing, QoS aware routing.

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 ADHOC FOR 4G 9

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary perspective, Co-operative networks:- Architecture, methods of cooperation, co-operative antennas, Integration of ad hoc networks with other wired and wireless networks.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Identify different issues in wireless ad hoc and sensor networks.
- To analyze protocols developed for ad hoc and sensor networks.

- To identify and address the security threats in ad hoc and sensor networks.
- Establish a Sensor network environment for different types of applications.

BOOKS FOR REFERENCES:

1. C.Siva Ram Murthy and B.S.Manoj, “Ad Hoc Wireless Networks Architectures and protocols”, 2nd edition, Pearson Education, 2007.
2. Charles E. Perkins, “Adhoc Networking”, Addison – Wesley, 2000.
3. Stefano Basagni, Marco Conti, Silvia Giordano and Ivan stojmenovic, “Mobile Ad Hoc networking”, Wiley-IEEE press, 2004.
4. Mohammad Ilyas, “The handbook of adhoc wireless networks”, CRC press,2002.
5. T. Camp, J. Boleng, and V. Davies “A Survey of Mobility Models for Ad Hoc Network Research,” Wireless Communication and Mobile Comp., Special Issue on Mobile Ad Hoc Networking Research, Trends and Applications, vol. 2,no. 5, 2002, pp. 483–502.
6. Fekri M. Abduljalil and Shrikant K. Bodhe , “A survey of integrating IP mobility protocols and Mobile Ad hoc networks”, IEEE communication Survey and tutorials, v 9.no.1 2007.
7. V.T.Raisinhani and S.Iyer “Cross layer design optimization in wireless protocol stacks”, Computer communication, vol 27 no. 8, 2004.
8. V.T.Raisinhani and S.Iyer, ” ÉCLAIR; An Efficient Cross-Layer Architecture for wireless protocol stacks”, World Wireless cong., San Francisco, CA,May 2004.

PRIST DEEMED TO BE UNIVERSITY
NAAC ACCREDITED
THANJAVUR – 613403 - TAMILNADU

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Mapping of Courses to Crosscutting Issues

2022R

Programme Name &Code	Course Code	Course Tittle	Gender Sensitization	Professional Ethics	Environment and Sustainability	Human Values
B.Tech – 22UGCSEPT	22148S11P	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	-	-	-	-
B.Tech – 22UGCSEPT	22152S12P	DIGITAL SYSTEMS	-	-	-	-
B.Tech – 22UGCSEPT	22150H13P	DATA STRUCTURES AND ALGORITHMS	-	-	-	-
B.Tech – 22UGCSEPT	22150H14P	COMPUTER ARCHITECTURE AND ORGANIZATION	-	-	-	-
B.Tech – 22UGCSEPT	22150H15P	PROBLEM SOLVING AND PYTHON PROGRAMMING	-	-	-	-
B.Tech – 22UGCSEPT	22148S21P	NUMERICAL METHODS	-	-	-	-
B.Tech – 22UGCSEPT	22150H22P	MICROPROCESSORS AND INTERFACING	-	-	-	-
B.Tech – 22UGCSEPT	22150H23P	DATABASE MANAGEMENT SYSTEMS	-	-	-	-
B.Tech – 22UGCSEPT	22150H24P	DESIGN AND ANALYSIS OF ALGORITHMS	-	-	-	-
B.Tech – 22UGCSEPT	22150H25P	PROGRAMMING IN C	-	-	-	-

B.Tech – 22UGCSEPT	22148S31P	DISCRETE MATHEMATICS	-	-	-	-
B.Tech – 22UGCSEPT	22150H32P	OPERATING SYSTEM	-	-	-	-
B.Tech – 22UGCSEPT	22150H33P	ARTIFICIAL INTELLIGENCE	-	-	-	-
B.Tech – 22UGCSEPT	22150H34P	COMPUTER NETWORKS	-	-	-	-
B.Tech – 22UGCSEPT	22150L35P	OPERATING SYSTEMS AND NETWORKING LAB	-	-	-	-
B.Tech – 22UGCSEPT	22150H41P	SOFTWARE ENGINEERING FUNDAMENTALS	-	-	-	-
B.Tech – 22UGCSEPT	22150H43P	C# AND .NET FRAMEWORK	-	-	-	-
B.Tech – 22UGCSEPT	22150E44AP	THEORY OF COMPUTATION	-	-	-	-
B.Tech – 22UGCSEPT	22150E44BP	DATA WAREHOUSING AND DATA MINING	-	-	-	-
B.Tech – 22UGCSEPT	22150E44CP	PROFESSIONAL ETHICS IN ENGINEERING	-	✓	-	-
B.Tech – 22UGCSEPT	22150E44DP	ADVANCED DATABASES	-	-	-	-
B.Tech – 22UGCSEPT	22150L45P	INTERNET PROGRAMMING LAB	-	-	-	-
B.Tech – 22UGCSEPT	22150H51P	OBJECT ORIENTED ANALYSIS AND	-	-	-	-
B.Tech – 22UGCSEPT	22150H52P	SOFTWARE QUALITY MANAGEMENT	-	-	-	-

B.Tech – 22UGCSEPT	22150H53P	GRAPHICS AND MULTIMEDIA	-	-	-	-
B.Tech – 22UGCSEPT	22150E54AP	AD HOC AND SENSOR NETWORKS	-	-	-	-
B.Tech – 22UGCSEPT	22150E54BP	PRINCIPLES OF COMPILER DESIGN	-	-	-	-
B.Tech – 22UGCSEPT	22150E54CP	DISTRIBUTED SYSTEMS	-	-	-	-
B.Tech – 22UGCSEPT	22150E54DP	MOBILE COMPUTING	-	-	-	-
B.Tech – 22UGCSEPT	22150L55P	SOFTWARE DEVELOPMENT LAB	-	-	-	-
B.Tech – 22UGCSEPT	22150H61P	CRYPTOGRAPHY AND NETWORK SECURITY	-	-	-	-
B.Tech – 22UGCSEPT	22150H62P	ADVANCED JAVA PROGRAMMING	-	-	-	-
B.Tech – 22UGCSEPT	22150H63P	SOFTWARE TESTING	-	-	-	-
B.Tech – 22UGCSEPT	22160E64AP	PRINCIPLES OF MANAGEMENT	-	-	-	✓
B.Tech – 22UGCSEPT	22150E64BP	UNIX INTERNALS	-	-	-	-
B.Tech – 22UGCSEPT	2215064CP	GRAPH THEORY AND APPLICATIONS	-	-	-	-
B.Tech – 22UGCSEPT	22150E64DP	PROGRAMMING PARADIGMS	-	-	-	-
B.Tech – 22UGCSEPT	22150L65P	JAVA PROGRAMMING LAB	-	-	-	-
	22160S71P	TOTAL QUALITY MANAGEMENT	-		-	✓

B.Tech – 22UGCSEPT				-		
B.Tech – 22UGCSEPT	22150H72P	GRID AND CLOUD COMPUTING	-	-	-	-
B.Tech – 22UGCSEPT	22150H73P	MIDDLEWARE TECHNOLOGIES	-	-	-	-
B.Tech – 22UGCSEPT	22150E74AP	HIGH SPEED NETWORKS	-	-	-	-
B.Tech – 22UGCSEPT	22150E74BP	INFORMATION RETRIEVAL TECHNIQUES	-	-	-	-
B.Tech – 22UGCSEPT	22150E74CP	SOFTWARE PROJECT MANAGEMENT	-	-	-	✓
B.Tech – 22UGCSEPT	22150E74DP	CYBER FORENSICS	-	-	-	-
B.Tech – 22UGCSEPT	22150P75P	PROJECT	-	-	-	-
M.Tech - 22PGCSEFT	22248S11A	HIGHER MATHEMATICS	-	-	-	-
M.Tech - 22PGCSEFT	22250H12	MODERNOPERATINGSYSTEM	-	-	-	-
M.Tech - 22PGCSEFT	22250H13	MACHINELEARNING TECHNIQUES				
M.Tech - 22PGCSEFT	22250H14	ADHOCANDSENSORNETWORK	-	-	-	-
M.Tech - 22PGCSEFT	22250H15	ADVANCEDDATA STRUCTURESAND ALGORITHMS	-	-	-	-
M.Tech - 22PGCSEFT	22250E16A	MULTIMEDIA SYSTEMS	-	-	-	-
M.Tech - 22PGCSEFT	22250E16B	WEB ENGINEERING	-	-	-	-
M.Tech - 22PGCSEFT	22250E16C	SOFTWARE METRICS	-	-	-	-
M.Tech - 22PGCSEFT	22250L17	ADVANCED WEB TECHNOLOGIES LAB	-	-	-	-
M.Tech - 22PGCSEFT	22250H21	MIDDLEWARE TECHNOLOGIES	-	-	-	-
M.Tech -	22250H22	OBJECT ORIENTED SOFTWARE	-	-	-	-

22PGCSEFT		ENGINEERING				
M.Tech - 22PGCSEFT	22250H23	INTERNET OF THINGS	-	-	-	-
M.Tech - 22PGCSEFT	22250E24A	ADVANCED DISTRIBUTED COMPUTING	-	-	-	-
M.Tech - 22PGCSEFT	22250E24B	DATA WAREHOUSING & DATA MINING	-	-	-	-
M.Tech - 22PGCSEFT	22250E24C	INFORMATION RETRIEVAL TECHNIQUES	-	-	-	-
M.Tech - 22PGCSEFT	22250E25A	SERVICE ORIENTED ARCHITECTURE	-	-	-	-
M.Tech - 22PGCSEFT	22250E25B	HIGH SPEED NETWORKS	-	-	-	-
M.Tech - 22PGCSEFT	22250E25C	LANGUAGE TECHNOLOGIES	-	-	-	-
M.Tech - 22PGCSEFT	22250L26	.NET TECHNOLOGIES LAB	-	-	-	-
M.Tech - 22PGCSEFT	222TECWR	TECHNICAL WRITING /SEMINARS	-	-	-	-
M.Tech - 22PGCSEFT	22250H31	SOFTWARE PROJECT MANAGEMENT	-	-	-	✓
M.Tech - 22PGCSEFT	22250E32A	CLOUD COMPUTING	-	-	-	-
M.Tech - 22PGCSEFT	22250E32B	SPEECH PROCESSING AND SYNTHESIS	-	-	-	-
M.Tech - 22PGCSEFT	22250E32C	SOFT COMPUTING	-	-	-	-
M.Tech - 22PGCSEFT	22250E33A	ADVANCED DATABASE TECHNOLOGY	-	-	-	-
M.Tech - 22PGCSEFT	22250E33B	RECONFIGURABLE COMPUTING	-	-	-	-
M.Tech - 22PGCSEFT	22250E33C	GREEN COMPUTING	-	-	✓	-
M.Tech - 22PGCSEFT	22250E34A	SOFTWARE QUALITY ASSURANCE	-	-	-	-
M.Tech - 22PGCSEFT	22250E34B	BIO-INSPIRED COMPUTING	-	-	✓	-
M.Tech - 22PGCSEFT	22250E34C	WIRELESS APPLICATION PROTOCOLS	-	-	-	-
M.Tech - 22PGCSEFT	22250P35	PROJECT WORK- PHASE I	-	-	-	-
M.Tech - 22PGCSEFT	22250P41	PROJECT WORK- PHASE II	-	-	-	-
M.Tech - 22PGCSEPT	22248S11AP	HIGHER MATHEMATICS	-	-	-	-

M.Tech - 22PGCSEPT -	22250H12P	ADHOC & SENSOR NETWORKS	-	-	-	-
M.Tech - 22PGCSEPT	22250H13P	ADVANCED DATA STRUCTURES	-	-	-	-
M.Tech - 22PGCSEPT	22250L14P	ADVANCED WEB TECHNOLOGIES LAB	-	-	-	-
M.Tech - 22PGCSEPT	22250H21P	MIDDLEWARE TECHNOLOGIES	-	-	-	-
M.Tech - 22PGCSEPT	22250H22P	INTERNET OF THINGS	-	-	-	-
M.Tech - 22PGCSEPT	22250E23AP	ADVANCED DISTRIBUTED COMPUTING	-	-	-	-
M.Tech - 22PGCSEPT	22250E23BP	DATA WAREHOUSING &DATA MINING	-	-	-	-
M.Tech - 22PGCSEPT	22250E23CP	INFORMATION RETRIEVAL TECHNIQUES	-	-	-	-
M.Tech - 22PGCSEPT	22250L24P	.NET TECHNOLOGIES LAB	-	-	-	-
M.Tech - 22PGCSEPT	222TECWRP	TECHNICAL WRITING /SEMINARS	-	-	-	-
M.Tech - 22PGCSEPT	22250H31P	MODERN OPERATING SYSTEM	-	-	-	-
M.Tech - 22PGCSEPT	22250E32P	MACHINE LEARNING TECHNIQUES	-	-	-	-
M.Tech - 22PGCSEPT	22250E33AP	MULTIMEDIA SYSTEMS	-	-	-	-
M.Tech - 22PGCSEPT	22250E33BP	WEB ENGINEERING	-	-	-	-
M.Tech - 22PGCSEPT	22250E33CP	SOFTWARE METRICS	-	-	-	-
M.Tech - 22PGCSEPT	22250H41P	OBJECT ORIENTED SOFTWARE ENGINEERING	-	-	-	-
M.Tech - 22PGCSEPT	2250H42P	SOFTWARE PROJECT MANAGEMENT	-	-	-	✓
M.Tech - 22PGCSEPT	22250E43AP	SERVICE ORIENTED ARCHITECTURE	-	-	-	-
M.Tech - 22PGCSEPT	22250E43BP	HIGH SPEED NETWORKS	-	-	-	-
M.Tech - 22PGCSEPT	22250E43CP	LANGUAGE TECHNOLOGIES	-	-	-	-
M.Tech - 22PGCSEPT	22250P44P	PROJECT WORK- PHASE I	-	-	-	-

M.Tech - 22PGCSEPT	22250E51AP	CLOUD COMPUTING	-	-	-	-
M.Tech - 22PGCSEPT	22250E51BP	SPEECH PROCESSING AND SYNTHESIS	-	-	-	-
M.Tech - 22PGCSEPT	22250E51CP	SOFT COMPUTING	-	-	-	-
M.Tech - 22PGCSEPT	22250E52AP	ADVANCED DATABASE TECHNOLOGY	-	-	-	-
M.Tech - 22PGCSEPT	22250E52BP	RECONFIGURABLECOMPUTING	-	-	-	-
M.Tech - 22PGCSEPT	22250E52CP	GREEN COMPUTING	-	-	✓	-
M.Tech - 22PGCSEPT	22250E53AP	SOFTWARE QUALITY ASSURANCE	-	-	-	-
M.Tech - 22PGCSEPT	22250E53BP	BIO-INSPIREDCOMPUTING	-	-	✓	-
M.Tech - 22PGCSEPT	22250E53CP	WIRELESS APPLICATION PROTOCOLS	-	-	-	-
M.Tech - 22PGCSEPT	22250P61P	PROJECT WORK- PHASE II	-	-	-	-

PRIST UNIVERSITY
VALLAM, THANJAVUR.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PROGRAM HANDBOOK

B.TECH-CSEPART-TIME)

[REGULATION 2022]
[for candidates admitted to B.Tech CSE program from June 2022 onwards]

Humanvalue

Environmentandsustainability

Gender Sensitization

Professional Ethics

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, andother creative efforts in science and technology.
III. Graduating students to achieve professional status due to their mastery of ComputerScience 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 duringthe time of graduation through the program objectives. Students should be in possession of:

a) An ability to apply mathematical, algorithmic principles, and computing techniques inthe 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 andto 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 beleaders 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	
22148S11P	Transforms and Partial Differential Equations	3	1	0	4
22152S12P	Digital Systems	3	1	0	4
22150H13P	Data Structures and algorithms	3	1	0	4
22150H14P	Computer Architecture and Organization	3	1	0	4
22150H15P	Problem Solving And Python Programming	3	0	0	3
Total No. of credits					**19**

SEMESTER II

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22148S21P	Numerical Methods	3	1	0	4
22150H22P	Microprocessors and Interfacing	3	1	0	4
22150H23P	Database Management Systems	3	1	0	4
22150H24P	Design and Analysis Of Algorithm	3	1	0	4
22150H25P	Programming in C	3	0	0	3
Total No. of credits					**19**

SEMESTER III

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22148S31P	Discrete Mathematics	3	1	0	4
22150H32P	Operating System	4	0	0	4
22150H33P	Artificial Intelligence	4	0	0	4
22150H34P	Computer Networks	4	0	0	4
22150L35P	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	
22150H41P	Software Engineering Fundamentals	3	1	0	4
22150H42P	Internet Programming	3	1	0	4
22150H43P	C# And .Net Framework	3	1	0	4
221_ _E44_P	**Elective-I**	3	1	0	4
22150L45P	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	
22150H51P	Object Oriented Analysis and Design	4	0	0	4
22150H52P	Software Quality Management	3	1	0	4
22150H53P	Graphics and Multimedia	3	1	0	4
221_ _E54_P	**Elective –II**	3	1	0	4
22150L55P	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	
22150H61P	Cryptography and Network Security	4	0	0	4
22150H62P	Advanced Java programming	3	1	0	4
22150H63P	Software Testing	4	0	0	4
221_ _E64_P	**Elective III**	4	0	0	4
22150L65P	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	
22160S71P	Total Quality Management	3	0	0	3
22150H72P	Grid and Cloud Computing	4	0	0	4
22150H73P	Middleware Technologies	3	1	0	4
221_ _E74_P	**Elective IV**	3	0	0	3
22150P75P	Project	0	0	12	6
Total No. of credits					**20**

B.Tech, Part Time (Computer Science and Engineering)

LIST OF ELECTIVES SEMESTER – IV (ELECTIVE I)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22150E44AP	Theory of Computation	3	1	0	4
22150E44BP	Data Warehousing and Data Mining	3	1	0	4
22150E44CP	Professional Ethics in Engineering	3	1	0	4
22150E44DP	Advanced Databases	3	1	0	4

SEMESTER - V (ELECTIVE II)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22150E54AP	Ad hoc and Sensor Networks	3	1	0	4
22150E54BP	Principles of Compiler Design	3	1	0	4
22150E54CP	Distributed Systems	3	1	0	4
22150E54DP	Mobile Computing	3	1	0	4

SEMESTER – VI(ELECTIVE III)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22160E64AP	Principles of Management	4	0	0	4
22150E64BP	Unix Internals	4	0	0	4
22150E64CP	Graph Theory And Applications	4	0	0	4
22150E64DP	Programming paradigms	4	0	0	4

SEMESTER – VII (ELECTIVE VI)

Subject Code	Subject Name	Periods Per Week			C
		L	T	P	
22150E74AP	High Speed Networks	3	0	0	3
22150E74BP	Information Retrieval Techniques	3	0	0	3
22150E74CP	Software Project Management	3	0	0	3
22150E74DP	Cyber Forensics	3	0	0	3

CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Project	Total Credit
	Nos	Credit	Nos	Credit	Nos	Credit	Credit	
I	5	**19**	-	**-**	-	**-**	-	**19**
II	5	**19**	-	**-**	-	**-**	-	**19**
III	4	**16**	-	**-**	1	**02**	-	**18**
IV	3	**12**	1	**04**	1	**02**	-	**18**
V	3	**12**	1	**04**	1	**02**	-	**18**
VI	3	**12**	1	**04**	1	**02**	**-**	**18**
VII	3	**11**	1	**03**	**-**	**-**	**06**	**20**
Total Credits								**130**

TOTAL CREDITS	
Semester – I	**19**
Semester – II	**19**
Semester – III	**18**
Semester – IV	**18**
Semester – V	**18**
Semester – VI	**18**
Semester – VI	**20**
TOTAL CREDITS	**130**

22148S11P -TRANSFORMS AND PARTIAL DIFFERENTIALEQUATIONS

AIM:

To develop the skills for the students in the areas of Transforms and Partial Differential Equations. This will be necessary for their effective studies in a large number of engineering subjects like heat conduction, communication systems, electro-optics and electromagnetic theory. The course will also serve as a prerequisite for specialized studies and research.

OBJECTIVES:

- Solve simple second order differential equations;
- Be able to calculate Fourier series;
- Prove the Orthogonality of Eigenfunctions of boundary value problems;
- Be able to classify second order partial differential equations and choose the appropriate boundary conditions;
- Apply the method of separation of variables to standard PDEs;
- Understand the wide applications of differential equation;
- Use Laplace transforms to solve simple linear differential equations.

UNIT 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 andApplied

Mathematicians”, Macmillen , New York ,1988.
2. Grewal, B.S., “Higher Engineering Mathematics”, Thirty Sixth Edition, KhannaPublishers, 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., ManicavachagomPillay, 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/SemI

22152S12P- 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

22150H13P- DATA STRUCTURES AND ALGORITHMS

AIM:

To emphasize, the practical application of techniques for analyzing the performance of algorithms and to know fundamentals of data structures.

OBJECTIVES:

- To learn the systematic way of solving problems
- To understand the different methods of organizing large amounts of data
- To efficiently implement solutions for specific problems
- To gain knowledge of various sorting techniques.
- To efficiently implement the different data structures

UNIT-I 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, YeedidyahLangsam, Moshe J. Augenstein, 'Data structuresusing C', Pearson Education, 2004 / PHI.
3. M. A. Weiss, "Data Structures and Algorithm Analysis in C", 2nded, 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 ProgramDesign in C’, Pearson Education, 2000 / PHI.
3. Y. Langsam, M. J. Augenstein and A. M. Tenenbaum, “Data Structures using C”, Pearson Education Asia, 2004.
4. Richard F. Gilberg, Behrouz A. Forouzan, “Data Structures – A Pseudocode Approach with C”, Thomson Brooks / COLE, 1998.
5. Aho, J. E. Hopcroft and J. D. Ullman, “Data Structures and Algorithms”, Pearson education Asia, 1983.

CSE/Sem I

22150H14P– 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, ZvonkoVranesic and SafwatZaky, 5th Edition “Computer Organization”, McGraw-Hill, 2002.

REFERENCES:

1. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 6th Edition, Pearson Education, 2003.
2. David A. Patterson and John L.Hennessy, “Computer Organization and Design: The hardware / software interface”, 2nd Edition, Morgan Kaufmann, 2002.
3. John P.Hayes, “Computer Architecture and Organization”, 3rd Edition, McGraw Hill, 1998.

22150H15P–PROBLEMSOLVINGANDPYTHONPROGRAMMING

AIM:

To introduce the students about object oriented programming and design.

OBJECTIVES:

On completion of the class, a student should be able:

- To knowthebasicsofalgorithmicproblemsolving
- To read and write simplePython programs.
- To develop Python programswithconditionals and loops.
- Todefine Pythonfunctions and call them.
- TousePython data structures –-lists, tuples, dictionaries.
- To do input/output with filesin Python

UNITI ALGORITHMICPROBLEMSOLVING 9

Algorithms, buildingblocksofalgorithms(statements,state,controlflow,functions),notation(pseudo code,flowchart,programminglanguage),algorithmicproblemsolving,simplestrategiesfordeveloping algorithms(iteration,recursion).Illustrativeproblems:findminimuminalist,insertacardinal,guessan integer number in arrange, TowersofHanoi.

UNITII DATA, EXPRESSIONS, STATEMENTS 9

Python Interpreterandinteractivemode;valuesandtypes:int,float,boolean,string,andlist;variables,expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchangethe valuesof two variables,circulatethevaluesofn variables, distancebetween two points.

UNITIII CONTROLFLOW, FUNCTIONS 9

Conditionals:Booleanvaluesandoperators,conditional(if),alternative(if-else),chainedconditional(if-elif-else);Iteration:state,while,for,break,continue,pass;functions:returnvalues,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, suman arrayofnumbers, linearsearch,binary search.

UNITIV LISTS, TUPLES, DICTIONARIES 9

Lists:listoperations,listslices,listmethods,listloop,mutability,aliasing,cloninglists,lis tparameters; Tuples: tupleassignment,tupleasreturnvalue;Dictionaries:operationsandmethods;advancedli st processing-listcomprehension;Illustrativeprograms:selection sort, insertion sort, mergesort, histogram.

UNITV FILES, MODULES, PACKAGES 9

Filesandexception:textfiles,readingandwritingfiles,formatoperator;commandlinearg uments,errors and exceptions, handling exceptions, modules, packages;Illustrativeprograms:word count, copyfile.

TOTAL:45 PERIODS

Text Book:
Balagurusamy E, “Object Oriented Programming with C++”, 3/E, TMG, 2006.

Reference :
1. Hubbard, “Programming with C++”, 2/e, Schaum Outline Series, TMH, 2006.
2. Bjarne Stroustrup, "The C++ Programming Language", Addison WesleyPublications, Second Edition, 1991.
3. SarangProonachandra,”Object Oriented Programming with C++”, PHI, 2006.
4. Jagadev A K, Rath A M, and DehuriS,”Object Oriented Programming Using C++”, PHI, 2007.

22148S21P-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

.

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

22150H22P - 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, 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 , SunetraChowdhury,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.

CSE/SemII

22150H23P-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 toBCNF).

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. RamezElmasri 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

CSE/SemII

22150H24P- 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 andconquer – 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.

<u>TEXT BOOKS:</u>

1. AnanyLevitin, "Introduction to the Design and Analysis of Algorithm", Pearson Education Asia, 2003.

<u>REFERENCES:</u>

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 Designand Analysis", Pearson Education Asia, 2003.
3. A.V.Aho, J.E. Hopcroft and J.D.Ullman, "The Design and Analysis Of Computer Algorithms", Pearson Education Asia, 2003.

22150H22P - PROGRAMMING IN C

OBJECTIVES:

To develop C Programs using basic programming constructs

- To develop C programs using arrays and strings

- To develop applications in C using functions, pointers and structures
- To do input/outputand filehandlingin C

UNITI BASICS OF C PROGRAMMING 12

Introduction to programming paradigms-Structure ofCprogram-Cprogramming:Data Types–Storage classes- Constants–EnumerationConstants-Keywords– Operators:PrecedenceandAssociativity-Expressions- Input/outputstatements, Assignmentstatements–Decisionmakingstatements-Switch statement-Looping statements – Pre-processordirectives- Compilation process

UNITII ARRAYS ANDSTRINGS 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,linearand binary search

UNITIII FUNCTIONSANDPOINTERS 9+3

Introductiontofunctions:Functionprototype,functiondefinition,functioncall, Built-infunctions(string functions, math functions) – Recursion – Example Program: Computation of Sine series, Scientific calculatorusingbuilt-infunctions,BinarySearchusingrecursivefunctions–Pointers–Pointer operators–Pointer arithmetic –Arraysand pointers – Arrayof pointers –Example Program:Sorting ofnames –Parameterpassing: Passbyvalue,Passbyreference–ExampleProgram:Swappingoftwonumbersand changingthe valueofa variableusingpassbyreference

UNITIV STRUCTURES 9+3

Structure-Nestedstructures–PointerandStructures–Arrayofstructures–ExampleProgramusing structuresandpointers–Self-referentialstructures–Dynamicmemory allocation-Singly linked list-typedef

UNITV FILEPROCESSING 9+3

Files–Typesoffileprocessing:Sequentialaccess,Randomaccess–Sequentialaccessfile-Example Program: Findingaverageofnumbersstoredinsequentialaccessfile-Randomaccessfile-Example Program:Transaction processingusingrandomaccess files – Command line arguments

TOTAL:60 PERIODS

OUTCOMES:

Learners should beableto:

- Develop simple applicationsin Cusingbasic constructs
- Design and implementapplicationsusing arraysand strings
- Develop and implementapplicationsin Cusingfunctions and pointers.
- Develop applicationsin Cusing structures.
- Design applicationsusing sequential land randomaccessfileprocessing.

TEXTBOOKS:

1. ReemaThareja, ―Programming in C‖, Oxford University Press, Second Edition, 2016.
2. Kernighan, B.W and Ritchie,D.M, ―The C Programming language‖, SecondEdition,

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 Indiapvt. Ltd., 2011
3. PradipDey, ManasGhosh, ―Fundamentals of Computing and Programming in C‖,First Edition, Oxford University Press, 2009

4. Anita Goel and Ajay Mittal, ―Computer Fundamentals and Programming in C‖, Dorling
Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

5. Byron S. Gottfried, "Schaum's Outline of Theory and Problems of Programming with
C",McGraw-Hill Education, 1996.

CSE/SemIII

22148S31P- DISCRETE MATHEMATICS

AIM:

This course will develop the intuition for discrete mathematics reasoning involving numbersand 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/SemIII

22150H32P- 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, 4^{th} Edition, 2003.
4. Pramod Chandra P. Bhatt – "An Introduction to Operating Systems, Concepts and Practice", PHI, 2003.

CSE/SemIII

22150H33P- 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 – Explanationbased 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.

CSE/SemIII

22150H34P - COMPUTER NETWORKS

AIM:

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

OBJECTIVES:

- To understand the concepts of data communications.
- To study the functions of different layers.
- To introduce IEEE standards employed in computer networking.
- To make the students to get familiarized with different protocols and network components.

UNIT I DATA COMMUNICATIONS 9

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

UNIT II DATA LINK LAYER **9**

Error – detection and correction – Parity – LRC – CRC – Hamming code – low Control and Error control - stop and wait – go back-N ARQ – selective repeat ARQ- sliding window – HDLC. - LAN - Ethernet IEEE 802.3 - IEEE 802.4 - IEEE 802.5 - IEEE 802.11 – FDDI - SONET – Bridges.

UNIT III NETWORK LAYER **9**

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

UNIT IV TRANSPORT LAYER **9**

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

UNIT V APPLICATION LAYER **9**

Domain Name Space (DNS) – SMTP – FTP – HTTP - WWW – Security – Cryptography.

TOTAL: 45hrs

TEXT BOOK:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw-Hill, 2004.

REFERENCES:

James F. Kurose and Keith W. Ross, “Computer Networking: A Top-Down Approach Featuring the Internet”, Pearson Education, 2003.
Larry L.Peterson and Peter S. Davie, “Computer Networks”, Harcourt Asia Pvt. Ltd., Second Edition.
Andrew S. Tanenbaum, “Computer Networks”, PHI, Fourth Edition, 2003.
William Stallings, “Data and Computer Communication”, Sixth Edition, Pearson Education, 2000.

CSE/SemIII

22150L35P-OPERATING SYSTEMS AND NETWORKING LAB

LIST OF EXERCISE:

OPERATING SYSTEMS:

(Implement the following on LINUX platform. Use C for high level language implementation)

1. Shell programming
   - command syntax
   - write simple functions

- basic tests

2. Shell programming
   - loops
   - patterns
   - expansions
   - substitutions

3. Write programs using the following system calls of UNIX operating system:
   fork, exec, getpid, exit, wait, close, stat, opendir, readdir

4. Write programs using the I/O system calls of UNIX operating system (open, read, write, etc)

5. Write C programs to simulate UNIX commands like ls, grep, etc.

6. Implement some memory management schemes

NETWORKING:

1. Simulation of ARP / RARP.

2. Write a program that takes a binary file as input and performs bit stuffing and CRC Computation.

3. Simulation of Sliding-Window protocol.

4. Develop a Client – Server application for chat.

5. Develop a Client that contacts a given DNS Server to resolve a given host name.

6. Write a Client to download a file from a HTTP Server.

CSE/SemIV

22150H41P- SOFTWARE ENGINEERING FUNDAMENTALS

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. PankajJalote- An Integrated Approach to Software Engineering, Springer Verlag, 1997.
3. James F Peters and WitoldPedryez, “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.

CSE/SemIV

22150H42P-INTERNET PROGRAMMING

OBJECTIVES:

- To understand different Internet Technologies.
- To learn java-specific web services architectureTo design a context free grammar forany 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 – WebClients – 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.
2. Jeffrey C and Jackson, ―Web Technologies A Computer Science Perspective‖Pearson Education, 2011.
4. Gopalan N.P. and AkilandeswariJ.,Web Technology‖, Prentice Hall of India, 2011.
5. UttamK.Roy, ―Web Technologies‖, Oxford University Press, 2011.

CSE/SemIV

22150H43P-C # AND . NET FRAMEWORK

AIM:

The goal of this course is to provide students with the knowledge and skills they need to develop C# applications for the Microsoft .NET Platform.

OBJECTIVES:

- An ability to understand C# program structure, language syntax, and implementation details.
- An ability to develop application using C# on .NET frame work.

UNIT I INTRODUCTION TO C# 8+3

Introducing C#, Understanding .NET, Overview of C#, Literals, Variables, Data Types, Operators, Expressions, Branching, Looping, Methods, Arrays, Strings, Structures, Enumerations.

UNIT II OBJECT ORIENTED ASPECTS OF C# 9+3

Classes, Objects, Inheritance, Polymorphism, Interfaces, Operator Overloading, Delegates, Events, Errors and Exceptions.

UNIT III APPLICATION DEVELOPMENT ON .NET 8+3

Building Windows Applications, Accessing Data with ADO.NET.

UNIT IV WEB BASED APPLICATION DEVELOPMENT ON .NET 8+3

Programming Web Applications with Web Forms, Programming Web Services.

UNIT V THE CLR AND THE .NET FRAMEWORK 12+3

Assemblies, Versioning, Attributes, Reflection, Viewing MetaData, Type Discovery, Reflecting on a Type, Marshaling, Remoting, Understanding Server Object Types, Specifying a Server with an Interface, Building a Server, Building the Client, Using SingleCall, Threads.

TOTAL : 60 hrs

TEXT BOOKS:

1. E. Balagurusamy, "Programming in C#", Tata McGraw-Hill, 2004. (Unit I, II)
2. J. Liberty, "Programming C#", 2nd ed., O'Reilly, 2002. (Unit III, IV, V)

REFERENCES:

1. Herbert Schildt, “The Complete Reference: C#”, Tata McGraw-Hill, 2004.
2. Robinson et al, “Professional C#”, 2nd ed., Wrox Press, 2002.
3. Andrew Troelsen, “C# and the .NET Platform”, A! Press, 2003.
4. S. ThamaraiSelvi, R. Murugesan, “A Textbook on C#”, Pearson Education, 2003.

CSE/SemIV

22150L45P- 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.

CSE/SemV

22150H51P- 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 - MeasuringUser Satisfaction

TOTAL : 45hrs

<u>TEXT BOOKS:</u>

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)

<u>REFERENCES:</u>

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.

22150H52P- SOFTWARE QUALITY MANAGEMENT

AIM:

To introduce an integrated approach to software development incorporating quality management methodologies.

OBJECTIVES:

- Software quality models.
- Quality measurement and metrics.
- Quality plan, implementation and documentation.
- Quality tools including CASE tools.
- Quality control and reliability of quality process.
- Quality management system models.
- Complexity metrics and Customer Satisfaction.
- International quality standards – ISO, CMM.

UNIT I INTRODUCTION TO SOFTWARE QUALITY 9+3

Software Quality – Hierarchical 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”.

CSE/Sem V

22150H53P- GRAPHICS AND MULTIMEDIA

AIM:

Provide an opportunity for students to represent, design and implement twodimensional 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 Andleighand KiranThakrar, "Multimedia Systems and Design", PHI, 2003. (UNIT 3 to 5)

REFERENCES:

1. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
2. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", Pearson Education, second edition 2003.

CSE/Sem V

22150L55P- SOFTWARE DEVELOPMENT LAB

IMPLEMENTATION OF PROJECT USING SOFTWARE ENGINEERING TECHNIQUES:

1. PROJECT PLANNING
2. SOFTWARE REQUIREMENT ANALYSIS
3. DATA MODELLING & IMPLEMENTATION
4. SOFTWARE TESTING
5. SOFTWARE DEBUGGING

LIST OF EXPERIMENTS

Develop the following software using software Engineering methodology:

1. Online Railway 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.

CSE/Sem VI

22150S61P- CRYPTOGRAPHY AND NETWORK SECURITY

OBJECTIVES:

- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanismsin 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 - SYSTEMSECURITY: 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, PHI3rd 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

22150H62P- 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.

CSE/Sem VI

22150H63P- 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. SrinivasanDesikan and Gopalaswamy Ramesh, " Software Testing – Principles and Practices", Pearson education, 2006.
2. AdityaP.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. RenuRajani, Pradeep Oak, "Software Testing – Effective Methods, Tools and Techniques", Tata McGraw Hill, 2004.

CSE/Sem VI

22150L65P- JAVA PROGRAMMING LAB

LIST OF PRACTICALS

AIM:

To learn and Practice the basics of JAVA language

OBJECTIVES:

1. To learn & practice the Object Oriented concepts like Inheritance, Overloading etc.
2. To learn & practice Interfaces and Packages
3. To learn &practice Java applet programming

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

CSE/Sem VII

22150S71P-TOTAL QUALITY MANAGEMENT

AIM:

Learning various TQM techniques to tackle and analyze problems in improving quality with particular reference to their own working environment.

OBJECTIVE:

- Develop the ability to adopt new techniques and synthesize new knowledge.
- Analyze basic operational and research data using TQM techniques in a systematic way.
- Cooperate efficiently and effectively in a team to apply TQM techniques and tools for accomplishing pre-determined goals.
- Identify opportunities for improvement in the business, service, administrative and manufacturing environments of applying the methodology such as Six Sigma, Kaizen, and other appropriate tools to achieve breakthrough improvements in these processes.

UNIT I FUNDAMENTALS 9

Definition of quality – Dimensions of quality – Quality planning – Quality costs –Analysis techniques for quality costs – Basic concepts of total quality management –Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation.

UNIT II TQM PRINCIPLES 9

Customer Satisfaction – Customer Perception of Quality – Customer Complaints –Service Quality – Customer Retention – Employee Involvement – Motivation –Empowerment – Teams – Recognition and Reward – Performance Appraisal –Benefits – Continuous Process Improvement – Juran Trilogy – 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

<u>TEXT BOOK:</u>

1. Besterfiled et al D.H., “Total Quality Management”, Pearson Education, Inc.2003.

<u>REFERENCES:</u>

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.

CSE/Sem VII

22150H72P-GRID AND CLOUD COMPUTING

OBJECTIVES:

The student should be made to:

- Understand how Grid computing helps in solving large scale scientific problems.
- Gain knowledge on the concept of virtualization that is fundamental to cloud computing.
- Learn how to program the grid and the cloud.
- Understand the security issues in the grid and the cloud environment.

UNIT I INTRODUCTION 9

Evolution of Distributed computing: Scalable computing over the Internet – Technologies fornetwork based systems – clusters of cooperative computers - Grid computing Infrastructures – cloud computing - service oriented architecture – Introduction to Grid Architecture and standards – Elements of Grid – Overview of Grid Architecture.

UNIT II GRID SERVICES 9

Introduction to Open Grid Services Architecture (OGSA) – Motivation – Functionality Requirements – Practical & Detailed view of OGSA/OGSI – Data intensive grid service models – OGSA services.

UNIT III VIRTUALIZATION 9

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: Everything as a service: Infrastructure, platform, software - Pros and Cons of cloud computing – Implementation levels of virtualization – virtualization structure – virtualizationof CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

UNIT IV PROGRAMMING MODEL 9

Open source grid middleware packages – Globus Toolkit (GT4) Architecture , Configuration – Usage of Globus – Main components and Programming model - Introduction to Hadoop Framework – Mapreduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Design of Hadoop file system, HDFS concepts, command line and java interface, dataflow of File read & File write.

UNIT V SECURITY 9

Trust models for Grid security environment – Authentication and Authorization methods –Grid security infrastructure – Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud, Key privacy issues in the cloud.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Apply techniques to solve large scale scientific problems.
- Apply the concept of virtualization.
- Use the grid and cloud tool kits.
- Apply the security models in the grid and the cloud environment.

TEXT BOOK:

1. Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing:Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.

REFERENCES: 1. Jason Venner, "Pro Hadoop- Build Scalable, Distributed Applications inthe Cloud", A Press, 2009 2. Tom White, "HadoopThe Definitive Guide", First Edition. O‟Reilly, 2009. 3. Bart Jacob (Editor), "Introduction to Grid Computing", IBM Red Books,Vervante, 2005 4. Ian Foster, Carl Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", 2nd Edition, Morgan Kaufmann. 5. Frederic Magoules and Jie Pan, "Introduction to Grid Computing" CRC Press, 2009. 6. Daniel Minoli, "A Networking Approach to Grid Computing", John Wiley Publication, 2005. 7. Barry Wilkinson, "Grid Computing: Techniques and Applications", Chapman and Hall, CRC, Taylor and Francis Group, 2010.

22150H73P -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

<u>TEXT BOOKS:</u>

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.

<u>REFERENCES:</u>

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)

22150E44AP- THEORY OF COMPUTATION

<u>AIM:</u>

To introduces basic computation models and the necessary mathematical techniques to express computer science problems as mathematical statements and to formulate proofs

<u>OBJECTIVES:</u>

- To focus on the study of abstract models of computation.
- To assess via formal reasoning what could be achieved through computing whenthey are using it to solve problems in science and engineering.
- To introduce fundamental questions about problems, such as whether they can ornot 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", SecondEdition, Pearson Education/PHI, 2003
2. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition,TMH, 2003.
3. MichealSipser, "Introduction of the Theory and Computation", Thomson Brokecole,1997.

22150E44BP- DATA WAREHOUSING AND DATA MINING

OBJECTIVES:

- To understand data warehouse concepts, architecture, business analysis and tools
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.

UNIT I DATA WAREHOUSING, BUSINESS ANALYSIS AND ON-LINE 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- PatternEvaluation 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 OLAPtools.
- 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 MichelineKamber, ―Data Mining Concepts and Techniques‖, Third Edition,Elsevier, 2012.

REFERENCES:

1. Alex Berson and Stephen J.Smith, ―Data Warehousing, Data Mining & OLAP‖, TataMcGraw – Hill Edition, 35th Reprint 2016.

2. K.P. Soman, ShyamDiwakar and V. Ajay, ―Insight into Data Mining Theory and

3. Practice‖,Eastern Economy Edition, Prentice Hall of India, 2006.

4. Ian H.Witten and Eibe Frank, ―Data Mining: Practical Machine Learning Tools andTechniques‖, Elsevier, Second Edition.

CSE/Sem IV/Electives

22150E44CP-PROFESSIONAL ETHICS IN ENGINEERING

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.

9

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS

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

8

UNIT V GLOBAL ISSUES

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons

Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate SocialResponsibility.

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‖, PrenticeHall 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 andEngineers‖, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, ―Business Ethics: Decision Making for PersonalIntegrity and Social Responsibility‖ McGraw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. 6. World Community Service Centre, _ Value Education‘, Vethathiri publications, Erode, 2011.

CSE/Sem IV/Electives

22150E44DP- ADVANCED DATABASES

AIM:

To have strong knowledge on Database Management Systems, Database technologies , an application-oriented , system-oriented approach towards databasedesign.

OBJECTIVES:

- Be able to design high-quality relational databases and database applications.
- Have developed skills in advanced visual & conceptual modeling anddatabasedesign.
- 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. RamezElmasri&ShamkantB.Navathe, "Fundamentals of Database Systems", Fourth Edition , Pearson Education , 2004.
2. M.TamerOzsu , Patrick Ualduriel, "Principles of Distributed Database Systems", Second Edition, PearsonEducation, 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)

22150E54AP- AD HOC AND SENSOR NETWORKS

OBJECTIVES:

The student should be made to:

- Understand the design issues in ad hoc and sensor networks.
- Learn the different types of MAC protocols.
- Be familiar with different types of adhoc routing protocols.
- Be expose to the TCP issues in adhoc networks.
- Learn the architecture and protocols of wireless sensor networks.

UNIT I INTRODUCTION 9

Fundamentals of Wireless Communication Technology – The Electromagnetic Spectrum –Radio propagation Mechanisms – Characteristics of the Wireless Channel -mobile ad hoc networks (MANETs) and wireless sensor networks (WSNs) :concepts and architectures.
Applications of Ad Hoc and Sensor networks. Design Challenges in Ad hoc and Sensor Networks.

UNIT II MAC PROTOCOLS FOR AD HOC WIRELESS NETWORKS 9

Issues in designing a MAC Protocol- Classification of MAC Protocols- Contention based protocols- Contention based protocols with Reservation Mechanisms- Contention based protocols with Scheduling Mechanisms – Multi channel MAC-IEEE 802.11

UNIT III ROUTING PROTOCOLS AND TRANSPORT LAYER IN AD HOC WIRELESS NETWORKS 9

Issues in designing a routing and Transport Layer protocol for Ad hoc networks- proactiverouting, reactive routing (on-demand), hybrid routing- Classification of Transport Layer solutions-TCP over Ad hoc wireless Networks.

UNIT IV WIRELESS SENSOR NETWORKS (WSNS) AND MAC PROTOCOLS 9

Single node architecture: hardware and software components of a sensor node - WSN Network architecture: typical network architectures-data relaying and aggregation strategies -MAC layer protocols: self-organizing, Hybrid TDMA/FDMA and CSMA based MAC- IEEE802.15.4.

UNIT V WSN ROUTING, LOCALIZATION & QOS 9

Issues in WSN routing – OLSR- Localization – Indoor and Sensor Network Localization-absolute and relative localization, triangulation-QOS in WSN-Energy Efficient Design- Synchronization-Transport Layer issues.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Explain the concepts, network architectures and applications of ad hoc and wirelesssensor networks
- Analyze the protocol design issues of ad hoc and sensor networks
- Design routing protocols for ad hoc and wireless sensor networks with respect tosome protocol design issues
- Evaluate the QoS related performance measurements of ad hoc and sensor networks

TEXT BOOK:

1. C. Siva Ram Murthy, and B. S. Manoj, "Ad Hoc Wireless Networks: Architecturesand Protocols ", Prentice Hall Professional Technical Reference, 2008.

REFERENCES:

1. Carlos De MoraisCordeiro, Dharma PrakashAgrawal “Ad Hoc & Sensor Networks:Theory and Applications”, World Scientific Publishing Company, 2006.

2. Feng Zhao and LeonidesGuibas, "Wireless Sensor Networks", Elsevier Publication - 2002.

3. Holger Karl and Andreas Willig “Protocols and Architectures for Wireless Sensor Networks”, Wiley, 2005

4. KazemSohraby, Daniel Minoli, &TaiebZnati, “Wireless Sensor Networks-Technology, Protocols, and Applications”, John Wiley, 2007.

22150E54BP- PRINCIPLES OF COMPILER DESIGN

AIM:
To understand the design and implementation of a simple compiler.

OBJECTIVES:

- To understand the functions of the various phases of a 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. HenkAlblas 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

CSE/Sem V/Electives

22150E54CP- 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

<u>TEXT BOOK:</u>

1. George Coulouris, Jean Dollimore, Tim Kindberg "Distributed Systems Concepts and Design" Third Edition – 2002- Pearson Education Asia.

<u>REFERENCES:</u>

1. A.S.Tanenbaum, M.Van Steen " Distributed Systems" Pearson Education 2004
2. MukeshSinghal, Ohio State University, Columbus "Advanced Concepts In Operating Systems" McGraw-Hill Series in Computer Science, 1994.

22150E54DP- MOBILE COMPUTING

AIM:

The aim of the course is to make student to be familiar with the basics concept of Mobile Communication and mobile devices .Focus will be on cellular mobile system units and different aspects of cellular communication.

OBJECTIVES:

- To present necessary concepts for Mobile Communication.
- Understanding different mobile devices and system.
- Understanding the Cellular System design.
- Study Co-channel and Non Co-channel Interference.
- Understanding channel assignment and 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:60hrs

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. KavehPahlavan, PrasanthKrishnamoorthy, "Principles of Wireless Networks", PHI/Pearson Education, 2003.

2. UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, New York, 2003.
3. HazysztofWesolowshi, "Mobile Communication Systems", John Wiley and Sons Ltd, 2002.

SEMESTER – VI
(ELECTIVE III)

22160E64AP– 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.

22150E64BP- 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. UreshVahalia, "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

22150E64CP- GRAPH THEORY AND APPLICATIONS

OBJECTIVES:

- To understand fundamentals of graph theory.
- To study proof techniques related to various concepts in graphs.
- To explore modern applications of graph theory.

UNIT I **9**

Introduction - Graph Terminologies - Types of Graphs - Sub Graph- Multi Graph - Regular Graph - Isomorphism - Isomorphic Graphs - Sub-graph - Euler graph - Hamiltonian Graph - Related Theorems.

UNIT II **9**

Trees -Properties- Distance and Centres - Types - Rooted Tree-- Tree Enumeration- Labeled Tree - Unlabeled Tree - Spanning Tree - Fundamental Circuits- Cut Sets - Properties - Fundamental Circuit and Cut-set- Connectivity- Separability -Related Theorems.

UNIT III **9**

Network Flows - Planar Graph - Representation - Detection - Dual Graph - Geometric and Combinatorial Dual - Related Theorems - Digraph - Properties - Euler Digraph.

UNIT IV **9**

Matrix Representation - Adjacency matrix- Incidence matrix- Circuit matrix - Cut-set matrix - Path Matrix- Properties - Related Theorems - Correlations. Graph Coloring - Chromatic Polynomial - Chromatic Partitioning - Matching - Covering - Related Theorems.

UNIT V **9**

Graph Algorithms- Connectedness and Components- Spanning Tree- Fundamental Circuits- Cut Vertices- Directed Circuits- Shortest Path - Applications overview.

TOTAL : 45 PERIODS

OUTCOMES:

At the end of the course, the 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", McGraw Hill ,2007.

CSE/Sem VI/Electives

22150E64DP– PROGRAMMING PARADIGMS

AIM:

Develop a greater understanding of the issues involved in programming language Design and implementation

OBJECTIVES:

- Develop an in-depth understanding of functional, logic, and object-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**

<u>TEXT BOOK:</u>

1. Cay S. Horstmann and Gary Cornell, "Core Java: Volume I – Fundamentals", Eighth Edition, Sun Microsystems Press, 2008.

<u>REFERENCES:</u>

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.

CSE/Sem VII/Electives

SEMESTER – VII (ELECTIVE VI) 22150E73AP- HIGH SPEED NETWORKS

<u>AIM:</u>

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.

<u>OBJECTIVES:</u>

- 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&PravinVaraiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. IrvanPepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003

CSE/Sem VII/Electives

22150E73BP-INFORMATION RETRIEVAL TECHNIQUES

OBJECTIVES:

- To understand the basics of Information Retrieval.
- To understand machine learning techniques for text classification and clustering.
- To understand various search engine system operations.
- To learn different techniques of recommender system.

UNIT I INTRODUCTION 9

Information Retrieval – Early Developments – The IR Problem – The User‗s Task – Information versus Data Retrieval - The IR System – The Software Architecture of the IR System – The Retrieval and Ranking Processes - The Web – The e-Publishing Era – How theweb 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.RicardoBaeza-Yates and BerthierRibeiro-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, CambridgeUniversity Press, 2008.
2. Stefan Buettcher, Charles L. A. Clarke and Gordon V. Cormack, ―Information Retrieval:Implementing and Evaluating Search Engines, The MIT Press, 2010.

CSE/Sem VII/Electives

22150E73CP- 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. PankajJalote, "*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

22150E73DP-CYBER FORENSICS

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 MobilePlatforms.

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 &Francis Group–2008.

Humanvalue

Environmentandsustainability

Gender Sensitization

Professional Ethics

PRIST

DEEMED TO BE

UNIVERSITY

NAAC ACCREDITED

THANJAVUR – 613 403 - TAMIL NADU

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PROGRAM HANDBOOK

M.Tech

COMPUTER SCIENCE AND ENGINEERING

[FULL TIME]

[REGULATION 2022]

COURSE STRUCTURE

SEMESTER – I

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
I	22248S11A	Higher Mathematics	4	1	0	4
I	22250H12	Modern Operating System	4	0	0	4
I	22250H13	MachineLearningTechniques	4	0	0	4
I	22250H14	Adhoc and Sensor Network	4	0	0	4
I	22250H15	Advanced Data Structures and Algorithms	4	1	0	4
I	22250E16_	Elective - I	3	0	0	3
Practical						
I	22250L17	Advanced Web Technologies Lab	-	-	3	3
Total no of Credit					**26**	

SEMESTER – II

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250H21	Middleware Technologies	3	1	0	4
II	22250H22	Object Oriented Software Engineering	4	0	0	4
II	22250H23	Internet of Things	4	0	0	4
II	22250E24_	Elective II	3	0	0	3
II	22250E25_	Elective – III	3	0	0	3
Practical						
II	22250L26	.NET Technologies Lab	-	-	3	3
II	222TECWR	Technical Writing /Seminars	-	-	3	3
Total no of Credit					**24**	

SEMESTER – III

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250H31	Software Project Management	4	0	0	4
III	22250E32_	Elective-IV	3	0	0	3
III	22250E33_	Elective-V	3	0	0	3
III	22250E34_	Elective-VI	3	0	0	3
III	22250P35	Project Work- Phase I*	-	-	10	10
Total no of Credit					**23**	

SEMESTER – IV

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	22250P41	Project Work- Phase II*	-	-	15	15
Total no of Credit					**15**	

*** - 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	22250E16A	Multimedia Systems	3	0	0	3
I	22250E16B	Web Engineering	3	0	0	3
I	22250E16C	Software Metrics	3	0	0	3

SEMESTER – II - Elective – II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E24A	Advanced Distributed Computing	3	0	0	3
II	22250E24B	Data Warehousing & Data Mining	3	0	0	3
II	22250E24C	Information Retrieval Techniques	3	0	0	3

SEMESTER – II - Elective – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E25A	Service Oriented Architecture	3	0	0	3
II	22250E25B	High Speed Networks	3	0	0	3
II	22250E25C	Language Technologies	3	0	0	3

SEMESTER – III - Elective – IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E32A	Cloud Computing	3	0	0	3
III	22250E32B	Speech Processing and Synthesis	3	0	0	3
III	22250E32C	Soft Computing	3	0	0	3

SEMESTER – III - Elective – V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E33A	Advanced Database Technology	3	0	0	3
III	22250E33B	Reconfigurable Computing	3	0	0	3
III	22250E33C	Green Computing	3	0	0	3

SEMESTER – III - Elective – VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E34A	Software Quality Assurance	3	0	0	3
III	22250E34B	Bio-inspired Computing	3	0	0	3
III	22250E34C	Wireless Application Protocols	3	0	0	3

Human value

Environment and sustainability **Gender Sensitization**

Professional Ethics

22248S11A - 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.

22250H12 - 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

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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.

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

22250H13 - MACHINE LEARNING TECHNIQUES

L T P C4 0 0 4

AIM:

The main objective of this paper is to make the students to know the need of Machine Learning Techniques.

OBJECTIVES:

To introduce students to the basic concepts and techniques of Machine Learning.
To have a thorough understanding of the Supervised and Unsupervised learning techniques
To study the various probability based learning techniques
To understand graphical models of machine learning algorithms

UNITI INTRODUCTION 9

Learning – Types of Machine Learning – Supervised Learning – The Brain and the Neuron –DesignaLearningSystem –PerspectivesandIssuesinMachineLearning – ConceptLearningTask–ConceptLearningasSearch–FindingaMaximallySpecificHypothesis–VersionSpacesand the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – LinearSeparability–LinearRegression.

UNITII LINEARMODELS 9

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation–RadialBasisFunctionsandSplines–Concepts–RBFNetwork–CurseofDimensionality–InterpolationsandBasisFunctions–SupportVectorMachines.

UNITIII TREE ANDPROBABILISTICMODELS 9

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification andRegression Trees – Ensemble Learning – Boosting – Bagging – Different ways to CombineClassifiers – Probability and Learning – Data into Probabilities – Basic Statistics – GaussianMixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms –VectorQuantization–SelfOrganizingFeatureMap

UNITIV DIMENSIONALITYREDUCTIONANDEVOLUTIONARYMODELS 9

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – FactorAnalysis – Independent Component Analysis – Locally Linear Embedding – Isomap – LeastSquares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: - GeneticOperators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting LostExample–MarkovDecisionProcess

UNITV GRAPHICALMODELS 9

Markov ChainMonteCarloMethods–Sampling–ProposalDistribution–MarkovChainMonte Carlo–GraphicalModels–BayesianNetworks–MarkovRandomFields–HiddenMarkovModels–TrackingMethods

Total : 45 hrs

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

REFERENCES:

EthemAlpaydin,―IntroductiontoMachineLearning3e(AdaptiveComputationandMachineLearning Series)‖, ThirdEdition,MITPress,2014
JasonBell,―Machinelearning–HandsonforDevelopersandTechnicalProfessionals‖,FirstEdition,Wiley, 2014
PeterFlach,―MachineLearning:TheArtandScienceofAlgorithmsthatMakeSenseofData‖,FirstEdition,CambridgeUniversity Press,2012.
StephenMarsland,―MachineLearning–AnAlgorithmicPerspective‖,SecondEdition,ChapmanandHall/CRCMachineLearningandPatternRecognitionSeries,2014.
TomMMitchell,―MachineLearning‖,FirstEdition,McGrawHillEducation,2013.

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

22250H14 –ADHOC AND SENSOR NETWORK

L T P C
4 0 0 4

AIM:

13

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

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.

HOD DEAN DEAN ACADEMIC AFFAIRS

22250H15 - 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 :60hrs

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.

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

22250L17 -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.

22250H21 - 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

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

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

22250H22 - 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.

22250H23 - INTERNET OF THINGS

L T P C
4 0 0 4

AIM:

To introduce the student to various IOT techniques.

OBJECTIVES:

- TounderstandthefundamentalsofInternetofThings
- Tolearn about thebasicsofIOT protocols
- Tobuild asmalllowcostembeddedsystem usingRaspberry Pi.

UNITI INTRODUCTION TOIoT 9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels &Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management withNETCONF-YANG-IoTPlatformsDesign Methodology

UNITII IoT ARCHITECTURE 9

M2Mhigh-levelETSIarchitecture-IETFarchitectureforIoT-OGCarchitecture-IoTreference model-Domainmodel-informationmodel-functionalmodel-communicationmodel-IoTreferencearchitecture

Toapply theconceptofInternetofThingsinthereal worldscenario.

UNITIII IoTPROTOCOLS **9**

Protocol Standardization for IoT– Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus–ZigbeeArchitecture–Networklayer–6LowPAN-CoAP-Security

UNITIV BUILDINGIoTWITH RASPBERRY PI&ARDUINO **9**

Building IOT with RASPERRY PI-IoT Systems - Logical Design using Python – IoT PhysicalDevices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi -RaspberryPi Interfaces -ProgrammingRaspberryPi with Python- Other IoT Platforms-Arduino.

UNITV CASE STUDIESAND REAL-WORLD APPLICATIONS **9**

Realworlddesignconstraints-Applications-Assetmanagement,Industrialautomation,smartgrid,Commercialbuildingautomation,Smartcities-participatorysensing-DataAnalyticsforIoT –Software& ManagementToolsforIoT CloudStorageModels&CommunicationAPIs–Cloud for IoT-AmazonWeb ServicesforIoT.

TOTAL: 45PERIODS

REFERENCES:

1.ArshdeepBahga,VijayMadisetti,―InternetofThings–Ahands-on approach‖,UniversitiesPress,2015

2.Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting theInternetofThings‖,Springer,2011.

3.HonboZhou,―TheInternetofThingsintheCloud:AMiddlewarePerspective‖, CRCPress,2012.

4.Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, StefanAvesand.DavidBoyle,"FromMachine-to-Machine totheInternetofThings-Introductiontoa NewAgeofIntelligence",Elsevier, 2014.

5.Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – KeyapplicationsandProtocols‖,Wiley,2012

22250L26 - .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.

22250H31 - 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
22250E16A - 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 IIIMultimedia 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 IVMultimedia 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**

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

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 KiranThakrar, "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.

22250E16B- WEB ENGINEERING

L	T	P	C
4	0	0	4

OBJECTIVES:

- Understandthecharacteristics ofweb applications
- Learnto Model webapplications
- Be awareofSystematicdesign methods
- Befamiliarwiththetestingtechniquesforweb applications

UNITI INTRODUCTIONTOWEBENGINEERING 9

Motivation,CategoriesofWebApplications,CharacteristicsofWebApplications.Requirements of Engineering in Web Applications- Web Engineering-Components of WebEngineering-WebEngineeringProcess-Communication-Planning.

UNITII WEB APPLICATION ARCHITECTURES & MODELLING WEBAPPLICATIONS 9

Introduction-CategorizingArchitectures-SpecificsofWebApplicationArchitectures,Components of a Generic Web Application Architecture- Layered Architectures, 2-LayerArchitectures,N-LayerArchitectures-Data-aspectArchitectures,Database-centricArchitectures- Architectures for Web Document Management- Architectures for MultimediaData-ModelingSpecificsin WebEngineering, Levels,Aspects,PhasesCustomization,ModelingRequirements,HypertextModeling,Hypertext StructureModelingConcepts,Access Modeling Concepts, Relation to Content Modeling, Presentation Modeling, Relationto Hypertext Modeling, Customization Modeling, Modelling Framework-Modeling languages-Analysis Modeling for Web Apps-The Content Model-The Interaction Model-ConfigurationModel.

UNITIII WEB APPLICATIONDESIGN 9

Design for WebApps- Goals-Design Process-Interactive Design- Principles and Guidelines-Workflow-Preliminaries-DesignSteps-Usability-Issues-InformationDesign-InformationArchitecture- structuring- Accessing Information-Navigation Design- Functional Design-WepApp Functionality-DesignProcess-FunctionalArchitecture- Detailed Functional Design.

UNITIV TESTINGWEBAPPLICATIONS 9

Introduction-Fundamentals-TestSpecificsinWebEngineering-TestApproaches-ConventionalApproaches,AgileApproaches-Testingconcepts-TestingProcess-TestScheme-Test Methods and Techniques- Link Testing- Browser Testing-Usability Testing-Load, Stress, and Continuous Testing, Testing Security, Test-driven Development, -ContentTesting-UserInterfacetesting-UsabilityTesting-CompatibilityTesting-ComponentLevelTesting-Navigation Testing-Configuration testing-Security and Performance Testing- TestAutomation.

UNITV PROMOTINGWEBAPPLICATIONS ANDWEBPROJECT MANAGEMENT 9

Introduction-challengesinlaunchingthewebApplication-PromotingWebApplication-ContentManagement-UsageAnalysis-WebProjectManagement-ChallengesinWebProject Management-Managing Web Team- Managing the Development Process of a WebApplication- Risk, Developing a Schedule, Managing Quality, Managing Change, TrackingtheProject.Introduction tonodeJS-websockets.

TOTAL: 45 PERIODS

OUTCOMES:

Uponcompletionofthis course,thestudentsshouldbeableto:

- Explainthecharacteristicsof webapplications.
- Modelwebapplications.
- Designweb applications.
- Testweb applications.

REFERENCES:

1. ChrisBates,―WebProgramming:BuildingInternetApplications‖,ThirdEdition,WileyIndiaEdition,2007.
2. GertiKappel,BirgitProll,―WebEngineering‖,JohnWileyandSonsLtd,2006.
3. GuyW.Lecky-Thompson,―WebProgramming‖,CengageLearning,2008.
4. JohnPaulMueller,―WebDevelopmentwithMicrosoftVisualStudio2005‖,Wiley Dream tech,2006.
5. RogerS.Pressman,DavidLowe,―WebEngineering‖,TataMcGrawHillPublication,2007.

22250E16C - 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

SEMESTER – II - ELECTIVE – II

22250E24A - 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

HOD DEAN DEAN ACADEMIC AFFAIRS

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 MugeshSinghal,Niranjan G Shivaratri,”Advanced Concepts in Operating Systems”,Tata McGraw Hill Edition, 2001.

6. Principles of Distributed Database Systems, M.TamerOzsu, Patrick Valduriez –Pearson Education

22250E24B- 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 – Miningthe World Wide Web.

TOTAL = 45HRS

REFERENCES:

1. Jiawei Han and MichelineKamber “Data Mining Concepts and Techniques” Second Edition, Elsevier, Reprinted 2008.

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2. Alex Berson and Stephen J. Smith “Data Warehousing, Data Mining & OLAP”, Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, ShyamDiwakar and V. Ajay “Insight into Data mining Theory and Practice”, Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta “Introduction to Data Mining with Case Studies”, Easter Economy Edition, Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar “Introduction to Data Mining”, Pearson Education, 2007.

22250E24C- INFORMATIONRETRIEVALTECHNIQUES

L T P C
4 0 0 4

OBJECTIVES:

- Tounderstandthebasicsofinformationretrievalwithpertinencetomodeling,queryoperationsand indexing
- Toget an understandingofmachine learningtechniquesfortextclassificationandclustering.
- TounderstandthevariousapplicationsofinformationretrievalgivingemphasistomultimediaIR,web search
- Tounderstandtheconceptsofdigitallibraries

UNITI INTRODUCTION:MOTIVATION 9

Basic Concepts – Practical Issues - Retrieval Process – Architecture - Boolean Retrieval – RetrievalEvaluation–OpenSourceIRSystems–HistoryofWebSearch–WebCharacteristics– TheimpactofthewebonIR—IRVersusWebSearch–ComponentsofaSearchengine

UNITII MODELING 9

TaxonomyandCharacterizationofIRModels–BooleanModel–VectorModel-TermWeighting –ScoringandRanking–LanguageModels–SetTheoreticModels-ProbabilisticModels– AlgebraicModels–StructuredTextRetrievalModels–ModelsforBrowsing

UNITIII INDEXING 9

StaticandDynamicInvertedIndices –IndexConstructionandIndexCompression.Searching-Sequential Searching and Pattern Matching. Query Operations -Query Languages – QueryProcessing - Relevance Feedback and Query Expansion - Automatic Local and Global Analysis –MeasuringEffectivenessandEfficiency

UNITIV CLASSIFICATIONANDCLUSTERING 9

TextClassificationandNaïveBayes–VectorSpaceClassification– SupportvectormachinesandMachinelearningondocuments.FlatClustering– HierarchicalClustering–Matrix decompositionsandlatentsemanticindexing– FusionandMetalearning

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UNITV SEARCHINGTHEWEB 9

Searching the Web –Structure of the Web –IR and web search – Static and Dynamic Ranking –Web Crawling and Indexing – Link Analysis - XML Retrieval Multimedia IR: Models andLanguages–IndexingandSearchingParallelandDistributedIR–DigitalLibraries

TOTAL: 45PERIODS

OUTCOMES:

Uponcompletionofthis course,thestudentsshouldbe ableto:

- BuildanInformation Retrievalsystem usingtheavailabletools.
- Identifyanddesignthevarious componentsofanInformation Retrievalsystem.
- ApplymachinelearningtechniquestotextclassificationandclusteringwhichisusedforefficientInformation Retrieval.
- Design an efficientsearchengineandanalyzetheWebcontentstructure.

REFERENCES:

1. ChristopherD.Manning,PrabhakarRaghavan,HinrichSchutze,―IntroductiontoInformation Retrieval‖,Cambridge UniversityPress,First SouthAsianEdition,2008.
2. Implementing and Evaluating Search Engines‖, The MIT Press, Cambridge,MassachusettsLondon,England,2010
3. RicardoBaeza–Yates,BerthierRibeiro–Neto,―ModernInformationRetrieval:Theconcepts and Technology behindSearch‖(ACMPressBooks),Second Edition,2011.
4. StefanButtcher,CharlesL.A.Clarke,GordonV.Cormack,―InformationRetrieval

22250E25A- 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.

22250E25B - 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

TEXT BOOK:

1. William Stallings, "HIGH SPEED NETWORKS AND INTERNET", Pearson Education, Second Edition, 2002.

REFERENCES:

1. Warland&PravinVaraiya, "HIGH PERFORMANCE COMMUNICATION NETWORKS", Jean Harcourt Asia Pvt. Ltd., II Edition, 2001.
2. IrvanPepelnjk, Jim Guichard and Jeff Apcar, "MPLS and VPN architecture", Cisco Press, Volume 1 and 2, 2003

22250E25C- LANGUAGETECHNOLOGIES

L T P C
4 0 0 4

OBJECTIVES:

- Tolearnthefundamentals ofnaturallanguageprocessing
- Toappreciatetheuse ofCFGandPCFGin NLP
- Tounderstand theroleofsemantics and pragmatics

UNITI INTRODUCTION 9

Words-RegularExpressionsandAutomata-WordsandTransducers-N-grams-Part-of-Speech–Tagging-HiddenMarkovandMaximumEntropyModels.

UNITII SPEECH 9

Speech–Phonetics-SpeechSynthesis-AutomaticSpeechRecognition-SpeechRecognition:-AdvancedTopics-ComputationalPhonology.

UNITIII SYNTAX 9

FormalGrammarsofEnglish-SyntacticParsing-StatisticalParsing-FeaturesandUnification -LanguageandComplexity.

UNITIV SEMANTICSANDPRAGMATICS 9

TheRepresentationofMeaning-ComputationalSemantics-LexicalSemantics-ComputationalLexicalSemantics -ComputationalDiscourse.

UNITV APPLICATIONS 9

InformationExtraction-QuestionAnsweringandSummarization-DialogueandConversationalAgents-MachineTranslation.

TOTAL:45PERIODS

OUTCOMES:

Uponcompletionofthiscourse,thestudentsshouldbeableto:

- Totagagiventextwith basicLanguagefeatures
- Todesignaninnovative application usingNLP components
- Toimplementarule basedsystemtotacklemorphology/syntaxofalanguage
- Todesigna tagsettobeusedfor statisticalprocessingforreal-timeapplications
- To compare and contrast use of different statistical approaches for different types ofNLPapplications.

REFERENCES:

1.Breck Baldwin, "Language Processing with Java and LingPipe Cookbook", AtlanticPublisher,2015.
2.DanielJurafsky,"SpeechandLanguageProcessing:An IntroductiontoNaturalLanguage Processing, Computational Linguistics and Speech", Pearson Publication,2014.

3.NitinIndurkhya and Fred J. Damerau, "Handbook of Natural Language Processing",SecondEdition,ChapmanandHall/CRCPress,2010.
4. RichardM Reese,"NaturalLanguage Processing withJava",O_ReillyMedia,2015.
5.Steven Bird, Ewan Klein and Edward Loper, -"Natural Language Processing withPython",FirstEdition,O_ReillyMedia,2009.

22250E32A - 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

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UNIT-IV **9**

Service Management in Cloud Computing - Service Level Agreements(SLAs)- Identity & Access Management - Access Control - Trust, Reputation, Risk - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

UNIT-V **9**

Cloud Security - Infrastructure Security - Network level security - Host level security - Application level security - Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location - Case Study on Open Source & Commercial Clouds – Eucalyptus - Microsoft Azure - Amazon EC2.

Total:45hrs

REFERENCE BOOKS:

1. Cloud Computing Bible, Barrie Sosinsky, Wiley-India, 2010
2. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, 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

22250E32B - SPEECH PROCESSING AND SYNTHESIS

L T P C
4 0 0 4

AIM:

To study about the Speech Processing and Synthesis

OBJECTIVES

To understand the mathematical foundations needed for speech processing
To understand the basic concepts and algorithms of speech processing and synthesis
To familiarize the students with the various speech signal representation, coding and recognition techniques

To appreciate the use of speech processing in current technologies and to expose the students to real–world applications of speech processing

UNITI FUNDAMENTALSOFSPEECHPROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – Syllables andWords–SyntaxandSemantics–Probability,StatisticsandInformationTheory–ProbabilityTheory–EstimationTheory–SignificanceTesting–InformationTheory.

UNITII SPEECHSIGNALREPRESENTATIONSANDCODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time FourierAnalysis – Acoustic Model of Speech Production – Linear Predictive Coding – CepstralProcessing–FormantFrequencies–TheRoleofPitch–SpeechCoding–LPCCoder.

UNITIII SPEECHRECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – PracticalIssues – Limitations. Acoustic Modeling – Variability in the Speech Signal – ExtractingFeatures – Phonetic Modeling – Adaptive Techniques – Confidence Measures – OtherTechniques.

UNITIV TEXTANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis –HomographDisambiguation–Morphological Analysis–Letter-to-soundConversion–Prosody–Generationschematic–SpeakingStyle–SymbolicProsody–Duration Assignment–PitchGeneration

UNITV SPEECHSYNTHESIS 9

Attributes–FormantSpeechSynthesis–ConcatenativeSpeechSynthesis–Prosodic ModificationofSpeech–Source-filterModelsforProsodyModification–EvaluationofTTSSystems.

TOTAL: 45 PERIODS

REFERENCES:

1. JosephMariani,―LanguageandSpeechProcessing‖,Wiley,2009.
2. LawrenceRabinerandBiing-HwangJuang,―FundamentalsofSpeechRecognition‖,PrenticeHallSignal ProcessingSeries,1993.
3. SadaokiFurui,―DigitalSpeechProcessing:Synthesis,andRecognition,SecondEdition,(Signal ProcessingandCommunications)‖, Marcel Dekker,2000.
4. ThomasF.Quatieri,―Discrete-TimeSpeechSignalProcessing‖,PearsonEducation,2002.
5. XuedongHuang,AlexAcero,Hsiao-Wuen Hon,―SpokenLanguageProcessing–A guidetoTheory,AlgorithmandSystemDevelopment‖,Prentice HallPTR,2001.

22250E32C - 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.

22250E33A – 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.

22250E33B - RECONFIGURABLE COMPUTING

L T P C
4 0 0 4

AIM:

To understand about the ReconfigurableComputing.

OBJECTIVES:

- Tounderstandtheneedforreconfigurable computing
- Toexposethestudents tovariousdevicearchitectures
- Toexamine thevarious reconfigurablecomputing systems
- Tounderstandthedifferenttypes ofcomputemodelsforprogramming reconfigurable
- architectures
- Toexpose thestudentstoHDL programmingandfamiliarizewith thedevelopment
- environment
- Toexposethestudents tothevariousplacementandroutingprotocols
- Todevelopapplications with FPGAs

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UNITI DEVICEARCHITECTURE 9

GeneralPurposeComputingVsReconfigurableComputing–SimpleProgrammableLogicDevices–ComplexProgrammableLogicDevices–FPGAs–DeviceArchitecture-CaseStudies.

UNITII RECONFIGURABLECOMPUTINGARCHITECTURESANDSYSTEMS 9

ReconfigurableProcessingFabricArchitectures–RPFIntegration intoTraditionalComputingSystems–ReconfigurableComputingSystems–CaseStudies–ReconfigurationManagement.

UNITIII PROGRAMMINGRECONFIGURABLESYSTEMS 9

ComputeModels-ProgrammingFPGAApplicationsinHDL–CompilingCforSpatialComputing –OperatingSystemSupportforReconfigurableComputing.

UNITIV MAPPING DESIGNS TO RECONFIGURABLE PLATFORMS 9

TheDesignFlow -Technology Mapping–FPGAPlacementandRouting–ConfigurationBitstreamGeneration–CaseStudieswithAppropriateTools.

UNITV APPLICATIONDEVELOPMENTWITH FPGAS 9

CaseStudiesofFPGAApplications–SystemonaProgrammableChip(SoPC)Designs.

TOTAL:45PERIODS

REFERENCES:

1. ChristopheBobda,―IntroductiontoReconfigurableComputing–Architectures,AlgorithmsandApplications‖,Springer,2010.
2. MayaB.GokhaleandPaulS.Graham,―ReconfigurableComputing:AcceleratingComputationwithField-Programmable GateArrays‖,Springer,2005.
3. FPGAFrontiers:NewApplicationsinReconfigurableComputing,2017,NicoleHemsoth,TimothyPrickettMorgan,NextPlatform.
4. ReconfigurableComputing:FromFPGAs toHardware/SoftwareCodesign 2011Editionby JoaoCardoso(Editor),MichaelHübne,Springer
5. ScottHauckandAndreDehon(Eds.), ―ReconfigurableComputing–TheTheory andPracticeofFPGA-BasedComputation‖,Elsevier/MorganKaufmann,2008.

22250E33C - 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.

22250E34A - 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. AdityaMathur, Foundations of software testing, Pearson Education, 2008.
3. SrinivasanDesikan and Gopalaswamy Ramesh, Software testing – principles and practices , Pearson education, 2006.
4. Ron Patton, Software Testing , second edition, Pearson education, 2007.

22250E34B - BIO-INSPIREDCOMPUTING

L T P C
4 0 0 4

OBJECTIVES:

- ToLearnbio-inspiredtheoremandalgorithms
- ToUnderstandrandomwalkandsimulatedannealing
- ToLearngenetic algorithmanddifferentialevolution
- ToLearn swarmoptimization andant colony forfeature selection
- Tounderstandbio-inspiredapplicationinimageprocessing

UNITI INTRODUCTION **9**

Introductiontoalgorithm-Newton'smethod-optimizationalgorithm-No-Free-LunchTheorems-Nature-InspiredMataheuristics-AnalysisofAlgorithms-NatureInspiresAlgorithms-Parametertuningandparametercontrol.

UNITII RANDOMWALK ANDANEALING **9**

Random variables - Isotropic random walks - Levy distribution and flights - Markov chains - step sizes and search efficiency - Modality and intermittent search strategy - importance ofrandomization-Eaglestrategy-AnnealingandBoltzmannDistribution-parameters-SAalgorithm-StochasticTunneling.

UNITIII GENETICALOGORITHMSANDDIFFERENTIALEVOLUTI ON **9**

Introductiontogeneticalgorithmsand-roleofgeneticoperators-choiceofparameters-GAvarients-schematheorem-convergenceanalysis-introductiontodifferentialevolution -varients- choiceofparameters -convergenceanalysis-implementation.

UNITIV SWARMOPTIMIZATIONANDFIREFLYALGORITHM 9

Swarmintelligence-PSOalgorithm-acceleratedPSO-implementation-convergenceanalysis-binaryPSO-TheFireflyalgorithm -algorithmanalysis -implementation-varients-Antcolonyoptimizationtoward featureselection.

UNITV APPLICATIONINIMAGEPROCESSING 9

Bio-Inspired Computation and its Applications in Image Processing: An Overview - Fine-Tuning Enhanced Probabilistic Neural Networks Using Meta-heuristic-driven Optimization -Fine-TuningDeepBeliefNetworksusingCuckooSearch-ImprovedWeightedThresholded Histogram Equalization Algorithm for Digital Image Contrast EnhancementUsingBatAlgorithm-GroundGlassOpacityNodulesDetectionandSegmentationusing SnakeModel -MobileObjectTrackingUsingCuckooSearch

TOTAL: 45 PERIODS

OUTCOMES:

Upon completionofthe course,thestudentsshouldbeableto

- Implementandapplybio-inspiredalgorithms
- Explainrandomwalkandsimulatedannealing
- Implementand applygeneticalgorithms
- Explainswarmintelligenceandantcolonyforfeatureselection
- Applybio-inspired techniquesinimageprocessing.

REFERENCES:

1. Eiben,A.E.,Smith,JamesE,"IntroductiontoEvolutionaryComputing",Springer 2015.
2. HelioJ.C.Barbosa,"AntColonyOptimization-TechniquesandApplications",Intech2013
3. Xin-She Yang , Jaao Paulo papa, "Bio-Inspired Computing and Applications in ImageProcessing",Elsevier2016
4. Xin-SheYang,"NatureIspiredOptimizationAlgorithm,ElsevierFirstEdition2014
5. Yang ,Cui,XIao,Gandomi,Karamanoglu ,"Swarm Intelligence and Bio-InspiredComputing",ElsevierFirstEdition2013

22250E34C - 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. Sandeepsinghal , JariAlwinen., -The Wireless Application Protocol: Writing Applications for the Mobile Internet - Addison Wesley Publications - 2000 .

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

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PRISTUNIVERSITY

VALLAM, THANJAVUR.

DEPARTMENT OF COMPUTER SCIENCE &

ENGINEERING

PROGRAM HANDBOOK

M.Tech

COMPUTER SCIENCE AND ENGINEERING

[PART TIME]

[REGULATION 2022]

[**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	22248S11AP	Higher Mathematics	3	1	0	4
I	22250H12P	Adhoc & Sensor Networks	4	0	0	4
I	22250H13P	Advanced Data Structures	4	0	0	4
Practical						
I	22250L14P	Advanced Web Technologies Lab	-	-	3	3
Total no of Credits					15	

SEMESTER – II

Semester. no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250H21P	Middleware Technologies	3	1	0	4
II	22250H22P	Internet of Things	4	0	0	4
II	22250E23_P	Elective I	4	0	0	4
Practical						
II	22250L24P	.NET Technologies Lab	-	-	3	3
II	222TECWRP	Technical Writing /Seminars	-	-	3	3
Total no of Credits						18

SEMESTER – III

Semester.no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250H31P	Modern Operating System	4	0	0	4
III	22250E32P	Machine Learning Techniques	4	0	0	4
III	22250E33_P	Elective-II	4	0	0	4
Total no of Credits					16	

SEMESTER – IV

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
IV	22250H41P	Object Oriented Software Engineering	4	0	0	4
IV	22250H42P	Software Project Management	4	0	0	4
IV	22250E43_P	Elective-V	4	0	0	4
IV	22250P44P	Project Work- Phase I	-	-	6	6
Total no of Credits					**18**	

SEMESTER – V

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
V	22250E51_P	Elective-IV	4	0	0	4
V	22250E52_P	Elective-V	4	0	0	4
V	22250E53_P	Elective-VI	4	0	0	4
Total no of Credits					**12**	

SEMESTER – VI

Semester no.	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
VI	22250P61P	Project Work- Phase II	0	0	12	12
Total no of Credits					**12**	

LIST OF ELECTIVES SEMESTER –

IIELECTIVE – I

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E23AP	Advanced Distributed Computing	4	0	0	4
II	22250E23BP	Data Warehousing & Data Mining	4	0	0	4
II	22250E23CP	Information Retrieval Techniques	4	0	0	4

SEMESTER – IIIELECTIVE – II

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E33AP	Multimedia Systems	4	0	0	4
III	22250E33BP	Web Engineering	4	0	0	4
III	22250E33CP	Software Metrics	4	0	0	4

SEMESTER – IV - ELECTIVE – III

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
II	22250E43AP	Service Oriented Architecture	4	0	0	4
II	22250E43BP	High Speed Networks	4	0	0	4
II	22250E43CP	Language Technologies	4	0	0	4

SEMESTER – V - ELECTIVE – IV

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E51AP	Cloud Computing	4	0	0	4
III	22250E51BP	Speech Processing and Synthesis	4	0	0	4
III	22250E51CP	Soft Computing	4	0	0	4

SEMESTER – V - ELECTIVE – V

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E52AP	Advanced Database Technology	4	0	0	4
III	22250E52BP	Reconfigurable Computing	4	0	0	4
III	22250E52CP	Green Computing	4	0	0	4

SEMESTER – V - ELECTIVE – VI

Semester no	Subject Code	Subject Title	Periods per Week			C
			L	T	P	
III	22250E53AP	Software Quality Assurance	4	0	0	4
III	22250E53BP	Bio-inspired Computing	4	0	0	4
III	22250E53CP	Wireless Application Protocols	4	0	0	4

CREDITS DISTRIBUTION

Semester	Theory Courses		Elective Courses		Practical Courses		Project	Total Credit
	Nos	Credit	Nos	Credit	Nos	Credit	Credit	
I	3	**12**	-	**-**	1	**03**	-	**15**
II	2	**08**	1	**04**	2	**06**	-	**18**
III	2	**08**	1	**04**	-	**-**	-	**12**
IV	2	**08**	1	**04**	-	**-**	**06**	**18**
V	-	**-**	3	**12**	-	**-**	-	**12**
VI	-	**-**	-	**-**	-	**-**	**12**	**12**
TOTAL	9	**36**	6	**24**	3	**9**	**18**	**87**
TOTAL CREDITS								**87**

TOTALCREDITS	
Semester – I	**15**
Semester – II	**18**
Semester – III	**12**
Semester – IV	**18**
Semester –V	**12**
Semester –VI	**12**
TOTAL	**87**

8

22248S11AP - HIGHER MATHEMATICS

L T P C31
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 abasic 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 setwhich 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 toComputer Science", TMH,NY-1997
2. M.K.Venkatraman, N.Sridharan and N.Chandrasekaran, " Discrete Mathematics", TheNational Publishing Company,2003
3. K.H.Rosen, Discrete Mathematics and its Applications, Mc-Graw Hill Book, 1999.

22250H12P –ADHOCAND SENSOR NETWORK

L T P C40
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. TCPOver 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.

22250H13P - ADVANCED DATA STRUCTURES

L T P C
31 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++, UiversityPress, 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

22250L14P -ADVANCED WEB TECHNOLOGIES LAB

L T P C
0033

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 andother 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 systemwith set of ASP/JSP pages.
   ii. Using sessions and cookies as part of the web application.

5. Writing Servlet Program using HTTP Servlet.
6. Any online application with database access.
7. Creation of XML document for a specific domain.
8. Writing DTD or XML schema for the domain specific XML document.
9. Parsing an XML document using DOM and SAX Parsers.
10. Sample web application development in the open source environment.

22250H21P - MIDDLEWARE TECHNOLOGIES

L T P C
31 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-tierArchitecture-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-InprocessActivation -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

22250H22P - INTERNET OF THINGS

L T P C
4 0 0 4

AIM:

To introduce the student to various IOT techniques.

OBJECTIVES:

- TounderstandthefundamentalsofInternetofThings
- Tolearn about thebasicsofIOT protocols
- Tobuild asmalllowcostembeddedsystem usingRaspberry Pi.

Toapply theconceptofInternetofThingsinthereal worldscenario.

UNITI INTRODUCTION TOIoT 9

Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels &Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management withNETCONF-YANG-IoTPlatformsDesign Methodology

UNITII IoT ARCHITECTURE 9

M2Mhigh-levelETSIarchitecture-IETFarchitectureforIoT-OGCarchitecture-IoTreference model-Domainmodel-informationmodel-functionalmodel-communicationmodel- IoTreferencearchitecture

UNITIII IoTPROTOCOLS 9

Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFIDProtocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– ZigbeeArchitecture–Networklayer–6LowPAN-CoAP-Security

UNITIV BUILDINGIoTWITH RASPBERRY PI&ARDUINO 9

Building IOT with RASPERRY PI-IoT Systems - Logical Design using Python – IoT PhysicalDevices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board - Linux on Raspberry Pi -RaspberryPi Interfaces -ProgrammingRaspberryPi with Python- Other IoTPlatforms- Arduino.

UNITV CASE STUDIESAND REAL-WORLD APPLICATIONS 9

Realworlddesignconstraints-Applications-
Assetmanagement,Industrialautomation,smartgrid,Commercialbuildingautomation,Smartcities-participatorysensing-DataAnalyticsforIoT
–Software& ManagementToolsforIoT CloudStorageModels&CommunicationAPIs–Cloud forIoT-AmazonWeb ServicesforIoT.

TOTAL: 45PERIODS

REFERENCES:

1. ArshdeepBahga,VijayMadisetti,―InternetofThings–Ahands-on approach‖,UniversitiesPress,2015
2. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting theInternetofThings‖,Springer,2011.
3. HonboZhou,―TheInternetofThingsintheCloud:AMiddlewarePerspective‖, CRCPress,2012.
4. Jan Ho¨ ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos, StefanAvesand.DavidBoyle,"FromMachine-to-Machine totheInternetofThings-Introductiontoa NewAgeofIntelligence",Elsevier, 2014.
5. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – KeyapplicationsandProtocols‖,Wiley,2012

22250L24P - .NET TECHNOLOGIES LAB

L T P C
0033

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 alreadyexists.

22250H31P - MODERN OPERATING SYSTEM

L T P C40
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 McGrawHill, 999.

22250E32P - MACHINE LEARNING TECHNIQUES

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 Machine Learning Techniques.

OBJECTIVES:

To introduce students to the basic concepts and techniques of Machine Learning.
To have a thorough understanding of the Supervised and Unsupervised learning techniquesTo study the various probability based learning techniques
To understand graphical models of machine learning algorithms

UNITI INTRODUCTION **9**

Learning – Types of Machine Learning – Supervised Learning – The Brain and theNeuron –DesignaLearningSystem –PerspectivesandIssuesinMachineLearning – ConceptLearningTask–ConceptLearningasSearch–FindingaMaximallySpecificHypothesis–VersionSpacesand the Candidate Elimination Algorithm – Linear Discriminants – Perceptron – LinearSeparability–LinearRegression.

UNITII LINEARMODELS **9**

Multi-layer Perceptron – Going Forwards – Going Backwards: Back Propagation Error – Multi-layer Perceptron in Practice – Examples of using the MLP – Overview – Deriving Back-Propagation–RadialBasisFunctionsandSplines–Concepts–RBFNetwork–CurseofDimensionality–InterpolationsandBasisFunctions–SupportVectorMachines.

UNITIII TREE ANDPROBABILISTICMODELS 9

Learning with Trees – Decision Trees – Constructing Decision Trees – Classification andRegression Trees – Ensemble Learning – Boosting – Bagging – Different ways to CombineClassifiers – Probability and Learning – Data into Probabilities – Basic Statistics – GaussianMixture Models – Nearest Neighbor Methods – Unsupervised Learning – K means Algorithms –VectorQuantization–SelfOrganizingFeatureMap

UNITIV DIMENSIONALITYREDUCTIONANDEVOLUTIONARYMODELS 9

Dimensionality Reduction – Linear Discriminant Analysis – Principal Component Analysis – FactorAnalysis – Independent Component Analysis – Locally Linear Embedding – Isomap – LeastSquares Optimization – Evolutionary Learning – Genetic algorithms – Genetic Offspring: -GeneticOperators – Using Genetic Algorithms – Reinforcement Learning – Overview – Getting LostExample–MarkovDecisionProcess

UNITV GRAPHICALMODELS 9

Markov ChainMonteCarloMethods–Sampling–ProposalDistribution–MarkovChainMonteCarlo–GraphicalModels–BayesianNetworks–MarkovRandomFields– HiddenMarkovModels–TrackingMethods

Total : 45 hrs

REFERENCES:

EthemAlpaydin,―IntroductiontoMachineLearning3e(AdaptiveComputationandMachineLearning Series)‖, ThirdEdition,MITPress,2014

JasonBell,―Machinelearning– HandsonforDevelopersandTechnicalProfessionals‖,FirstEdition,Wiley, 2014

PeterFlach,―MachineLearning:TheArtandScienceofAlgorithmsthatMakeSenseofData‖,FirstEditio n,CambridgeUniversity Press,2012.

StephenMarsland,―MachineLearning–AnAlgorithmicPerspective‖,SecondEdition,ChapmanandHall/CRCMachineLearningandPatter nRecognitionSeries,2014.

TomMMitchell,―MachineLearning‖,FirstEdition,McGrawHillEducation,2013.

22250H41P - OBJECT ORIENTED SOFTWARE ENGINEERING

L T P C40
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-Objectoriented 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 – TransformMapping – 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. Softwaretestingmethods-White Box, Basis Path-Control Structure –Black Box-Unit Testing- Integration testing-Validation & System testing. Testing OOA & OOD models-Object oriented testingstrategies.

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 principlesand methods for specific applications.

Total: 45 hrs

CSE/Semester - II

TEXT BOOKS:

1. Roger S. Pressman, " Software Engineering A Practitioner's Approach" , Fifth Edition,Tata McGraw Hill.
2. Grady Booch,JamesRumbaugh,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"PrenticeHall of India 2002.
4. Fairley, "Software Engineering Concepts", Mc.Graw Hill 1985.

22250H42P - SOFTWARE PROJECT MANAGEMENT

L T P C40
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 – ProcessControl 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 cGrawHill, 2004.

Semester - II

22250CRM - RESEARCH METHODOLOGY

L T P C30
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 VidyalayaPress.
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

CSE/Elective –I/Semester - I

SEMESTER – I - ELECTIVE – I 22250E23AP - ADVANCED DISTRIBUTED COMPUTING

L T P C
40 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 - FileService 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 andDesign”, 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”,TataMcGraw Hill Edition, 2001.
6. Principles of Distributed Database Systems, M.Tamer Ozsu, Patrick Valduriez –Pearson Education

CSE/Elective –II/Semester - II

22250E23BP- DATA WAREHOUSING & DATA MINING

L T P C40
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 – OnlineAnalytical 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-BasedMethods – Model-Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.

CSE/Elective –II/Semester - II

UNIT V MINING OTHER DATA 9

Mining Object, Spatial, Multimedia, Text and Web Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.

TOTAL = 45HRS

REFERENCES:

1. Jiawei Han and Micheline Kamber "Data Mining Concepts and Techniques" Second Edition, Elsevier, Reprinted 2008.
2. Alex Berson and Stephen J. Smith "Data Warehousing, Data Mining & OLAP", Tata McGraw – Hill Edition, Tenth Reprint 2007.
3. K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice",Easter Economy Edition, Prentice Hall of India, 2006.
4. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition,Prentice Hall of India, 2006.
5. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

CSE/Elective –II/Semester - II

22250E23C- ARTIFICIAL NEURAL NETWORKS

L T P C40
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 **Feedforward neural networks** **9**

Pattern classification using perception - Multilayer feed forward neural networks (MLFFNNs) - Pattern classification and regression using MLFFNNs - Error back propagation learning - Fast learning methods: Conjugate gradient method – Auto associative neural networks
- Bayesian neural networks.

UNIT-IV **Kernel methods for pattern analysis** **9**

Statistical learning theory - Support vector machines for pattern classification - Support vector regression for function approximation - Relevance vector machines for classification and regression - **Self-organizing maps:** Pattern clustering - Topological mapping - Kohonen's self- organizing map.

UNIT-V **Feedback neural networks** **9**

Pattern storage and retrieval - Hopfield model - Boltzmann machine - Recurrent neural networks.

Total: 45 hrs

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

SEMESTER – III - ELECTIVE – II

22250E33AP - MULTIMEDIA SYSTEMS

L T P C40
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 IIIMultimedia 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 IVMultimedia 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 retrievalTechnologies.

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 3to 5)
3. Judith Jeffcoate, "Multimedia in practice technology and Applications", PHI, 1998.
4. Foley, Vandam, Feiner, Huges, "Computer Graphics: Principles & Practice", PearsonEducation, second edition 2003.

CSE/Elective –I/Semester - I

22250E33BP- GENETIC ALGORITHMS

L T P C
40 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, measuringevolutionary 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 HallIndia, 2002.
2. Michael D. Vose, "The simple genetic algorithm foundations and theory, Prentice Hall India,1999.
3. Masatoshi Sakawa, "Genetic Algorithms & Fuzzy Multiobjective Optimization", KluwerAcademic Publisher, 2001
4. D. Quagliarella, J Periaux, C Poloni& G Winter, "Genetic Algorithms in Engineering & Computer science", John Wiley & Sons, First edition, 1997

CSE/Elective –I/Semester - I

22250E33CP- SOFTWARE METRICS

L T P C
40 0 4

AIM:

To understand software quality metrics.

OBJECTIVES:

- To introduce an integrated approach to software development incorporating qualitymanagement 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 - MeasurementsTheory - Goal Based Framework – SoftwareMeasurement Validation.

UNIT II DATA COLLECTION AND ANALYSIS **9**

Empirical Investigation - Planning Experiments - Software Metrics Data Collection - AnalysisMethods – 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", AddisonWesley

SEMESTER – IV - ELECTIVE – III

22250E43AP- 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 enterpriseApplications – Patterns for SOA – SOA programming models.

UNIT II **9**

Service-oriented Analysis and Design – Design of Activity, Data, Client and businessprocess services – Technologies of SOA – SOAP – WSDL – JAX – WS – XML WS for.NET – Service integration with ESB – Scenario – Business case for SOA – stakeholderobjectives – benefits of SPA – Cost Savings

UNIT III **9**

SOA implementation and Governance – strategy – SOA development – SOAgovernance – trendsin SOA – event-driven architecture – software s a service – SOAtechnologies – 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 – advancedmessaging

UNIT V **9**

Transaction processing – paradigm – protocols and coodination – transactionspecifications –SOA in mobile – research issues

Total: 45 hrs

REFERENCES:

1. Shankar Kambhampaly, "Service –Oriented Architecture for Enterprise Applications",WileyIndia Pvt Ltd, 2008.
2. Eric Newcomer, Greg Lomow, "Understanding SOA with Web Services", PearsonEducation.
3. Mark O' Neill, et al. , "Web Services Security", Tata McGraw-Hill Edition, 2003.

22250E43BP - HIGH SPEED NETWORKS

L T P C40
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, ATMlogical 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 - CongestionControl - 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 TCPover ATM. Traffic and Congestion control in ATM - Requirements - Attributes - Traffic Management Frame work, Traffic Control - ABR traffic Management - ABR rate control, RMcell 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 - ProtocolArchitecture, 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

22250E43CP- EMBEDDED SYSTEMS

L T P C40
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 caseof 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 Problemand 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 IndianReprint 2000.

SEMESTER – V - ELECTIVE – IV

22250E51AP - CLOUD COMPUTING

L T P C
4 0 0 4

AIM: To acquire basic knowledge on cloud computing and its applications.

OBJECTIVES:

- Identify cloud computing models, characteristics, and technologies.
- Get knowledge about the different architectures in cloud.
- Identify the information about service management and cloud securities.

UNIT-I **9**

Overview of Computing Paradigm- Recent trends in Computing - Evolution of cloud computing - Introduction to Cloud Computing -Cloud Computing (NIST Model)- Properties, Characteristics & Disadvantages - Cloud computing vs. Cluster computing vs. Grid computing - Role of Open Standards

UNIT-II **9**

Cloud Computing Architecture - Cloud computing stack - Service Models (XaaS) - Infrastructure as a Service(IaaS) - Platform as a Service(PaaS) - Software as a Service(SaaS)-Deployment Models

UNIT-III **9**

Infrastructure as a Service(IaaS) - Introduction to IaaS - Resource Virtualization – Examples.
Platform as a Service(PaaS) - Introduction to PaaS - Cloud Platform and Management – Examples - Software as a Service(SaaS) - Introduction to SaaS

UNIT-IV **9**

Service Management in Cloud Computing - Service Level Agreements(SLAs)- Identity & Access Management - Access Control - Trust, Reputation, Risk - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations - Authentication in cloud computing, Client access in cloud, Cloud contracting Model, Commercial and business considerations.

UNIT-V **9**

Cloud Security - Infrastructure Security - Network level security - Host level security - Application level security - Data security and Storage - Data privacy and security Issues, Jurisdictional issues raised by Data location -Case Study on Open Source & Commercial Clouds – Eucalyptus - Microsoft Azure - Amazon EC2.

Total:45hrs

REFERENCE BOOKS:

1. Cloud Computing Bible, BarrieSosinsky, 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

22250E51BP- SPEECH PROCESSING AND SYNTHESIS

L T P C
4 0 0 4

AIM: To study about the Speech Processing and Synthesis

OBJECTIVES

To understand the mathematical foundations needed for speech processing
To understand the basic concepts and algorithms of speech processing and synthesis To familiarize the students with the various speech signal representation, coding and recognition techniques
To appreciate the use of speech processing in current technologies and to expose the studentsto real–world applications of speech processing

UNITI FUNDAMENTALSOFSPEECHPROCESSING 9

Introduction – Spoken Language Structure – Phonetics and Phonology – SyllablesandWords– SyntaxandSemantics–Probability,StatisticsandInformationTheory– ProbabilityTheory– EstimationTheory–SignificanceTesting–InformationTheory.

UNITII SPEECHSIGNALREPRESENTATIONSANDCODING 9

Overview of Digital Signal Processing – Speech Signal Representations – Short time FourierAnalysis – Acoustic Model of Speech Production – Linear Predictive Coding – CepstralProcessing–FormantFrequencies–TheRoleofPitch–SpeechCoding–LPCCoder.

UNITIII SPEECHRECOGNITION 9

Hidden Markov Models – Definition – Continuous and Discontinuous HMMs – PracticalIssues – Limitations. Acoustic Modeling – Variability in the Speech Signal – ExtractingFeatures – Phonetic Modeling – Adaptive Techniques – Confidence Measures – OtherTechniques.

UNITIV TEXTANALYSIS 9

Lexicon – Document Structure Detection – Text Normalization – Linguistic Analysis –HomographDisambiguation–Morphological Analysis–Letter-to-soundConversion– Prosody–Generationschematic–SpeakingStyle–SymbolicProsody–Duration Assignment– PitchGeneration

UNITV SPEECHSYNTHESIS 9

Attributes–FormantSpeechSynthesis–ConcatenativeSpeechSynthesis–Prosodic ModificationofSpeech–Source-filterModelsforProsodyModification–EvaluationofTTSSystems.

TOTAL: 45 PERIODS

REFERENCES:

1. JosephMariani,―LanguageandSpeechProcessing‖,Wiley,2009.
2. LawrenceRabinerandBiing-HwangJuang,―FundamentalsofSpeechRecognition‖,PrenticeHallSignal ProcessingSeries,1993.
3. SadaokiFurui,―DigitalSpeechProcessing:Synthesis,andRecognition,SecondEdition,(Si gnal ProcessingandCommunications)‖, Marcel Dekker,2000.
4. ThomasF.Quatieri,―Discrete-TimeSpeechSignalProcessing‖,PearsonEducation,2002.
5. XuedongHuang,AlexAcero,Hsiao-Wuen Hon,―SpokenLanguageProcessing–A guidetoTheory,AlgorithmandSystemDevelopment‖,Prentice HallPTR,2001.

22250E51CP- SOFT COMPUTING

L T P C40 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.

SEMESTER – V - ELECTIVE – V **22250E52AP–ADVANCED**

DATABASE TECHNOLOGY

L T P C
40 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 – ServerSystem Architectures – Parallel Systems- Distributed Systems – Parallel Databases: I/OParallelism – 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 TierClient Server Architecture- Case Studies.

UNIT-II OBJECT AND OBJECT RELATIONAL DATABASES 9

Concepts for Object Databases: Object Identity – Object structure – TypeConstructors –Encapsulation of Operations – Methods – Persistence – Type and ClassHierarchies – Inheritance – Complex Objects – Object Database Standards, Languagesand Design: ODMG Model – ODL – OQL – Object Relational and Extended – RelationalSystems : Object Relational featuresinSQL/Oracle – Case Studies.

UNIT-III XML DATABASES 9

XML Databases: XML Data Model – DTD - XML Schema - XML Querying – WebDatabases –JDBC – Information Retrieval – Data Warehousing – Data Mining

UNIT-IV MOBILE DATABASES 9

Mobile Databases: Location and Handoff Management - Effect of Mobility on DataManagement - Location Dependent Data Distribution - Mobile Transaction Models -Concurrency Control -Transaction Commit Protocols- Mobile Database RecoverySchemes.

UNIT-V MULTIMEDIA DATABASES 9

Multidimensional Data Structures – Image Databases – Text/Document Databases-Video Databases – Audio Databases – Multimedia Database Design.

Total = 45 hrs

CSE/Elective –V/Semester – III

REFERENCES:

1. R. Elmasri, S.B. Navathe, “Fundamentals of Database Systems”, Fifth Edition,Pearson Education/Addison Wesley, 2007.

2. Thomas Cannolly and Carolyn Begg, " Database Systems, A Practical Approachto Design, Implementation and Management", Third Edition, Pearson Education,2007.
3. Henry F Korth, Abraham Silberschatz, S. Sudharshan, "Database SystemConcepts", FifthEdition, McGraw Hill, 2006.
4. C.J.Date, A.Kannan and S.Swamynathan,"An Introduction to DatabaseSystems", EighthEdition, Pearson Education, 2006.

22250E52BP - RECONFIGURABLE COMPUTING

L T P C
4 0 0 4

AIM:

To understand about the ReconfigurableComputing.

OBJECTIVES:

- Tounderstandtheneedforreconfigurable computing
- Toexposethestudents tovariousdevicearchitectures
- Toexamine thevarious reconfigurablecomputing systems
- Tounderstandthedifferenttypes ofcomputemodelsforprogramming reconfigurable
- architectures
- Toexpose thestudentstoHDL programmingandfamiliarizewith thedevelopment
- environment
- Toexposethestudents tothevariousplacementandroutingprotocols
- Todevelopapplications with FPGAs

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UNITI DEVICEARCHITECTURE 9

GeneralPurposeComputingVsReconfigurableComputing– SimpleProgrammableLogicDevices–ComplexProgrammableLogicDevices–FPGAs– DeviceArchitecture-CaseStudies.

UNITII RECONFIGURABLECOMPUTINGARCHITECTURESANDSYSTEMS 9

ReconfigurableProcessingFabricArchitectures– RPFIntegrationintoTraditionalComputingSystems– ReconfigurableComputingSystems– CaseStudies–ReconfigurationManagement.

UNITIII PROGRAMMINGRECONFIGURABLESYSTEMS 9

ComputeModels-ProgrammingFPGAApplicationsinHDL– CompilingCforSpatialComputing –OperatingSystemSupportforReconfigurableComputing.

UNITIV MAPPINGDESIGNS TORECONFIGURABLEPLATFORMS 9

TheDesignFlow -Technology Mapping–FPGAPlacementandRouting–ConfigurationBitstreamGeneration–CaseStudieswithAppropriateTools.

UNITV APPLICATIONDEVELOPMENTWITH FPGAS 9

CaseStudiesofFPGAApplications–SystemonaProgrammableChip(SoPC)Designs.

TOTAL:45PERIODS

REFERENCES:

1. ChristopheBobda,―IntroductiontoReconfigurableComputing–Architectures,AlgorithmsandApplications‖,Springer,2010.
2. MayaB.GokhaleandPaulS.Graham,―ReconfigurableComputing:AcceleratingComputationwithField-Programmable GateArrays‖,Springer,2005.
3. FPGAFrontiers:NewApplicationsinReconfigurableComputing,2017,NicoleHemsoth,TimothyPrickettMorgan,NextPlatform.
4. ReconfigurableComputing:FromFPGAs toHardware/SoftwareCodesign 2011Editionby JoaoCardoso(Editor),MichaelHübne,Springer
5. ScottHauckandAndreDehon(Eds.), ―ReconfigurableComputing–TheTheory andPracticeofFPGA-BasedComputation‖,Elsevier/MorganKaufmann,2008.

CSE/Elective –V/Semester – III

22250E52CP - GREEN COMPUTING

L T P C40 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, Videocard, Display.

UNIT-V **9**

Web, Temporal and Spatial Data Mining Materials recycling, Telecommuting, Middleware support for green computing, Tools for monitoring, HPC computing, Green Mobile, embeddedcomputing 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

SEMESTER – V - ELECTIVE – VI **22250E53AP - SOFTWARE QUALITY ASSURANCE**

L T P C
40 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 qualitymanagement 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 ofSQA– 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 – testadequacy, 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 –adhoctesting – website testing – usability testing – accessibility testingTest plan – management –execution and reporting – software test automation –automated testing tools

UNIT IV **9**

Hierarchical models of software quality – software quality metrics –function points – Softwareproduct quality – software maintenance quality – effect of case tools – software qualityinfrastructure – procedures – certifications – configuration management – documentationcontrol.

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, Pearsoneducation, 2009.
2. Aditya Mathur, Foundations of software testing, Pearson Education, 2008.
3. Srinivasan Desikan and Gopalaswamy Ramesh, Software testing – principles andpractices ,Pearson education, 2006.
4. Ron Patton, Software Testing , second edition, Pearson education, 2007.

CSE/Elective –VI/Semester – III

22250E53BP - BIO-INFORMATICS

L T P C40
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 DownVs 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.

22250E53CP - WIRELESS APPLICATION PROTOCOLS

L T P C40
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 forthe Mobile Internet - Addison Wesley Publications - 2000 .

PRIST DEEMED TO BE UNIVERSITY

School of Engineering & Technology

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

B.Tech – Civil Engineering PT (R-2022)

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 Val ues	Professional Ethics	Environment and Sustainability	Professional Ethics, Human Values and Environment and Sustainability	Gender Sensitization
B.Tech-22UGCVLPT	22148S11P	Transforms & Partial Differential Equations					✓			
B.Tech-22UGCVLPT	22155C12P	Strength of Materials I								
B.Tech-22UGCVLPT	22155C13P	Fluid Mechanics I								
B.Tech-22UGCVLPT	22155C14P	Plane and Geodetic Surveying								
B.Tech-22UGCVLPT	22155C15P	Irrigation Engineering						✓		
B.Tech-22UGCVLPT	22148S21P	Numerical Methods					✓			
B.Tech-22UGCVLPT	22155C22P	Strength of Materials II								
B.Tech-22UGCVLPT	22155C23P	Fluid Mechanics II								
B.Tech-22UGCVLPT	22155C24P	Concrete Technology								
B.Tech-	22155C25P	Soil Mechanics								

22UGCVLPT										
B.Tech-22UGCVLPT	22148S31P	Probability & Statistics					✓			
B.Tech-22UGCVLPT	22155C32P	Design of Reinforced Concrete Structures-I								
B.Tech-22UGCVLPT	22155C33P	Structural Analysis I								
B.Tech-22UGCVLPT	22155C34P	Construction Materials And Practice								
B.Tech-22UGCVLPT	22155L35P	Soil Mechanics laboratory								
B.Tech-22UGCVLPT	22155C41P	Design of Reinforced Concrete Structures-II								
B.Tech-22UGCVLPT	22155C42P	Structural Analysis II								
B.Tech-22UGCVLPT	22155C43P	Environmental Engineering					✓			
B.Tech-22UGCVLPT	22155E44AP	Total Station And GPS Surveying								
B.Tech-22UGCVLPT	22155E44BP	Water Resource Engineering					✓			
B.Tech-22UGCVLPT	22155E44CP	Basic Construction Materials								
B.Tech-22UGCVLPT	22155E44DP	Geographic Information System								
B.Tech-22UGCVLPT	22155E44EP	Construction Methods and Equipment Management				✓				
B.Tech-22UGCVLPT	22155C51P	Design of Steel Structures								
B.Tech-22UGCVLPT	22155C52P	Foundation Engineering								
B.Tech-22UGCVLPT	22155C53P	Waste Water Engineering						✓		
B.Tech-	22155E54AP	Air Pollution and								

22UGCVLPT		Control								
B.Tech-22UGCVLPT	22155E54BP	Transportation Engineering								
B.Tech-22UGCVLPT	22155E54CP	Water and waste water treatment						✓		
B.Tech-22UGCVLPT	22155E54DP	Remote sensing & GIS for rural development								
B.Tech-22UGCVLPT	22155E54EP	Soil Dynamics								
B.Tech-22UGCVLPT	22155C61P	Estimation & Cost Evaluation								
B.Tech-22UGCVLPT	22155C62P	Ground Water Hydrology						✓		
B.Tech-22UGCVLPT	22155C63P	Construction Project Management								
B.Tech-22UGCVLPT	22155E64AP	Advanced Soil Mechanics								
B.Tech-22UGCVLPT	22155E64BP	Advanced Foundation Engineering								
B.Tech-22UGCVLPT	22155E64CP	Airport & Harbors								
B.Tech-22UGCVLPT	22155E64DP	Applied Environmental Microbiology						✓		
B.Tech-22UGCVLPT	22155E64EP	Engineering Hydrology								
B.Tech-22UGCVLPT	22155S71P	Total Quality Management					✓			
B.Tech-22UGCVLPT	22155C72P	Housing, Planning & Management					✓			
B.Tech-22UGCVLPT	22155C73P	Repair And Rehabilitation of Structures								
B.Tech-22UGCVLPT	22155E74AP	Applied Seismology for Engineers								
B.Tech-22UGCVLPT	22155E74BP	Pre Fabricated Structures								
B.Tech-22UGCVLPT	22155E74CP	Earthquake Resistant Design								

		of Foundations								
B.Tech-22UGCVLPT	22155E74DP	Retrofitting and Rehabilitation of Civil Infrastructure								
B.Tech-22UGCVLPT	22155E74EP	Urban Transportation System Planning								
B.Tech-22UGCVLPT	22155P75P	Project Work								

PRIST DEEMED TO BE UNIVERSITY

School of Engineering & Technology

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

M.Tech – Structural Engineering FT (R-2022)

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 Environ ment and Sustainability	Gender Sensitization
M.Tech-22PGSTEFT	22248S11E	Advanced Engineering Mathematics					✓			
M.Tech-22PGSTEFT	22255C12	Quality Control &Assurance in Construction								
M.Tech-22PGSTEFT	22255C13	Theory of Plasticity and Elasticity								
M.Tech-22PGSTEFT	22255C14	Structural Dynamics								
M.Tech-22PGSTEFT	22255C15	Experimental Techniques								
M.Tech-22PGSTEFT	22255E16A	Prestressed Concrete Design								
M.Tech-22PGSTEFT	22255E16B	Theory of Plates								
M.Tech-22PGSTEFT	22255E16C	Water Resource Engineering						✓		
M.Tech-22PGSTEFT	22255E16D	Soil Structural Interaction								
M.Tech-22PGSTEFT	22255E16E	Remote Sensing Essentials								

M.Tech-22PGSTEFT	22255C21	Management Information System					✓			
M.Tech-22PGSTEFT	22255C22	Finite Element Analysis								
M.Tech-22PGSTEFT	22255C23	Advanced Concrete Structural Design								
M.Tech-22PGSTEFT	22255E24 A	Analysis And Design Of Tall Buildings								
M.Tech-22PGSTEFT	22255E24 B	Advanced Concrete Technology								
M.Tech-22PGSTEFT	22255E24 C	Soil Dynamics								
M.Tech-22PGSTEFT	22255E24 D	Rock Engineering								
M.Tech-22PGSTEFT	22255E24 E	Advanced Soil Mechanics								
M.Tech-22PGSTEFT	22255E25A	Design of sub structure								
M.Tech-22PGSTEFT	22255E25B	Advanced Foundation Engineering								
M.Tech-22PGSTEFT	22255E25 C	Elements of Earthquake Engineering								
M.Tech-22PGSTEFT	22255E25 D	Development and Applications of Special Concretes								
M.Tech-22PGSTEFT	22255E25 E	Vibration of Continuous Systems								
M.Tech-22PGSTEFT	222TECWR	Technical writing / Seminars								
M.Tech-22PGSTEFT	22255C31	Advanced Steel Structures								
M.Tech-22PGSTEFT	22255E32A	Optimization of Structures								
M.Tech-22PGSTEFT	22255E32B	Wind And Cyclone Effects On Structures								
M.Tech-22PGSTEFT	22255E32C	A seismic Design of Structures								
M.Tech-22PGSTEFT	22255E32D	Urban Transportation System Planning								

M.Tech-22PGSTEFT	22255E32E	Applied Seismology for Engineers								
M.Tech-22PGSTEFT	22255E33A	Prefabricated Structures								
M.Tech-22PGSTEFT	22255E33B	Design Of Bridges								
M.Tech-22PGSTEFT	22255E33C	Surface Water Hydrology						✓		
M.Tech-22PGSTEFT	22255E33D	Unsaturated Soil Mechanics								
M.Tech-22PGSTEFT	22255E33E	Remote Sensing and GIS for rural development								
M.Tech-22PGSTEFT	22255E34A	Offshore Structures								
M.Tech-22PGSTEFT	22255E34B	Structural Dynamics								
M.Tech-22PGSTEFT	22255E34C	Water Supply Engineering						✓		
M.Tech-22PGSTEFT	22255E34D	Water and waste water treatment						✓		
M.Tech-22PGSTEFT	22255E34E	Applied Environmental Microbiology						✓		
M.Tech-22PGSTEFT	22255P35	Project Work Phase-I								
M.Tech-22PGSTEFT	22255P41	Project Work Phase-II								

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School of Engineering & Technology

DEPARTMENT OF CIVIL ENGINEERING

Mapping of Courses to Cross Cutting Issues

M.Tech – Structural Engineering (R-2022) PT

Programme Name &Code	Course Code	Title of the Course	Cross Cutting Issues							
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainbility and Human Values	H man Values	Profes ional Ethics	Environment and Sustainability	Professional Ethics, Human Values and Environ ment and Sustainability	Gender Sensitization
M.Tech-22PGSTEPT	22248S11EP	Advanced Engineering Mathematics					✓			
M.Tech-22PGSTEPT	22255C12P	Quality Control & Assurance in Construction								
M.Tech-22PGSTEPT	22255C13P	Theory of Plasticity and Elasticity								
M.Tech-22PGSTEPT	22255C21P	Management Information System					✓			
M.Tech-22PGSTEPT	22255C22P	Finite Element Analysis								
M.Tech-22PGSTEPT	22255E23AP	Theory Of Plates								
M.Tech-22PGSTEPT	22255E23BP	Advanced Concrete Technology								

M.Tech-22PGSTEPT	22255E23CP	Water Resource Engineering						✓		
M.Tech-22PGSTEPT	22255E23DP	Soil Structural Interaction								
M.Tech-22PGSTEPT	22255E23EP	Remote Sensing Essentials					✓			
M.Tech-22PGSTEPT	222TECWRP	Technical Writing/ Seminars								
M.Tech-22PGSTEPT	22255C31P	Structural Dynamics								
M.Tech-22PGSTEPT	22255C32P	Maintenance and Rehabilitation of Structures								
M.Tech-22PGSTEPT	22255E33AP	Prestressed Concrete Design								
M.Tech-22PGSTEPT	22255E33BP	Analysis And Design Of Tall Buildings								
M.Tech-22PGSTEPT	22255E33CP	Soil Dynamics								
M.Tech-22PGSTEPT	22255E33DP	Rock Engineering								
M.Tech-22PGSTEPT	22255E33EP	Advanced Soil Mechanics								
M.Tech-22PGSTEPT	22255C41P	Advanced Concrete Structural design								
M.Tech-22PGSTEPT	22255C42P	Advanced Steel Structures								
M.Tech-22PGSTEPT	22255E43AP	Advanced Soil Mechanics								

M.Tech-22PGSTEPT	22255E43BP	Advanced Foundation Engineering								
M.Tech-22PGSTEPT	22255E43CP	Elements Earthquake Engineering								
M.Tech-22PGSTEPT	22255E43DP	Development and Applications of Special Concretes								
M.Tech-22PGSTEPT	22255E43EP	Vibration of Continuous Systems								
M.Tech-22PGSTEPT	22255P44P	Project Work Phase I								
M.Tech-22PGSTEPT	22255E51AP	Optimization of Structures								
M.Tech-22PGSTEPT	22255E51BP	Wind And Cyclone Effects On Structures								
M.Tech-22PGSTEPT	22255E51CP	A seismic Design of Structures								
M.Tech-22PGSTEPT	22255E51DP	Urban Transportation System Planning								
M.Tech-22PGSTEPT	22255E51EP	Applied Seismology for Engineers								
M.Tech-22PGSTEPT	22255E52AP	Prefabricat ed Structures								
M.Tech-22PGSTEPT	22255E52BP	Design of Bridges								
M.Tech-22PGSTEPT	22255E52CP	Remote Sensing and GIS for rural development								

M.Tech-22PGSTEPT	22255E52DP	Surface Water Hydrology						✓		
M.Tech-22PGSTEPT	22255E52EP	Unsaturated Soil Mechanics								
M.Tech-22PGSTEPT	22255E53AP	Offshore Structures								
M.Tech-22PGSTEPT	22255E53BP	Structural Dynamics								
M.Tech-22PGSTEPT	22255E53CP	Water Supply Engineering						✓		
M.Tech-22PGSTEPT	22255E53DP	Water and waste water treatment						✓		
M.Tech-22PGSTEPT	22255E53EP	Applied Environmental Microbiology						✓		
M.Tech-22PGSTEPT	22255P61P	Project Work Phase II								

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 PT CIVIL R2022

CURRICULUM & COURSE STRUCTURE

SEMESTER – I

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	22148S11P	Transforms & Partial Differential Equations	S	2	1	0	4
2	22155C12P	Strength of Materials I	C	3	1	0	4
3	22155C13P	Fluid Mechanics I	C	3	1	0	4
4	22155C14P	Plane and Geodetic Surveying	C	3	1	0	4
5	22155C15P	Irrigation Engineering	C	3	0	0	3
TOTAL							19

SEMESTER – II

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	22148S21P	Numerical Methods	S	3	1	0	4
2	22155C22P	Strength of Materials II	C	3	1	0	4
3	22155C23P	Fluid Mechanics II	C	3	1	0	4
4	22155C24P	Concrete Technology	C	3	1	0	4
5	22155C25P	Soil Mechanics	C	3	1	0	3
TOTAL							19

SEMESTER – III

S. No	Sub. Code	Name of the Subject	Core	L	T	P	C
1	22148S31P	Probability & Statistics	S	3	1	0	4
2	22155C32P	Design of Reinforced Concrete Structures-I	C	3	1	0	4
3	22155C33P	Structural Analysis I	C	3	1	0	4
4	22155C34P	Construction Materials And Practice	C	3	1	0	3
5	22155L35P	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	22155C41P	Design of Reinforced Concrete Structures-II	C	3	1	0	4
2	22155C42P	Structural Analysis II	C	3	1	0	4
3	22155C43P	Environmental Engineering	C	3	1	0	4
4	22155E44-P	Hard Core Elective I	-	3	1	0	4
5	22155L45P	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	22155C51P	Design of Steel Structures	C	3	1	0	4
2	22155C52P	Foundation Engineering	C	3	1	0	4
3	22155C53P	Waste Water Engineering	C	3	1	0	4
4	22155E54-P	Hard Core Elective II	-	3	1	0	4
5	22155L55P	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	22155C61P	Estimation & Cost Evaluation	C	3	1	0	4
2	22155C62P	Ground Water Hydrology	C	3	1	0	4
3	22155C63P	Construction Project Management	C	3	1	0	4
4	22155E64-P	Hard Core Elective III	-	3	1	0	4
5	22155L65P	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	22155S71P	Total Quality Management	S	3	0	0	3
2	22155C72P	Housing, Planning & Management	C	3	1	0	4
3	22155C73P	Repair And Rehabilitation of Structures	C	3	1	0	4
4	22155E74-P	Hard Core Elective IV	-	3	1	0	4
5	22155P75P	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	22155E44AP	Total Station And GPS Surveying	3	1	0	4
2	22155E44BP	Water Resource Engineering	3	1	0	4
3	22155E44CP	Basic Construction Materials	3	1	0	4
4	22155E44DP	Geographic Information System	3	1	0	4
5	22155E44EP	Construction Methods and Equipment Management	3	1	0	4

HARD CORE ELECTIVE II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22155E54AP	Air Pollution and Control	3	1	0	4
2	22155E54BP	Transportation Engineering	3	1	0	4
3	22155E54CP	Water and waste water treatment	3	1	0	4
4	22155E54DP	Remote sensing & GIS for rural development	3	1	0	4
5	22155E54EP	Soil Dynamics	3	1	0	4

HARD CORE ELECTIVE III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22155E64AP	Advanced Soil Mechanics	3	1	0	4
2	22155E64BP	Advanced Foundation Engineering	3	1	0	4
3	22155E64CP	Airport & Harbors	3	1	0	4
4	22155E64DP	Applied Environmental Microbiology	3	1	0	4
5	22155E64EP	Engineering Hydrology	3	1	0	4

HARD CORE ELECTIVE IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22155E74AP	Applied Seismology for Engineers	3	1	0	4
2	22155E74BP	Pre Fabricated Structures	3	1	0	4
3	22155E74CP	Earthquake Resistant Design of Foundations	3	1	0	4
4	22155E74DP	Retrofitting and Rehabilitation of Civil Infrastructure	3	1	0	4
5	22155E74EP	Urban Transportation System Planning	3	1	0	4

COURSE STRUCTURE
M.TECH FT STRUCTURAL R2022

SEMESTER – I

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22248S11E	Advanced Engineering Mathematics	3	1	0	4
2	22255C12	Quality Control &Assurance in Construction	3	1	0	4
3	22255C13	Theory of Plasticity and Elasticity	3	1	0	4
4	22255C14	Structural Dynamics	3	1	0	4
5	22255C15	Experimental Techniques	3	1	0	4
6	22255E16A	Hard Core Elective I	3	1	0	3
7	22255L17	Core Practical (Computer Programming Lab)	0	0	3	3
		TOTAL				26

SEMESTER – II

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255C21	Management Information System	3	1	0	4
2	22255C22	Finite Element Analysis	3	1	0	4
3	22255C23	Advanced Concrete Structural Design	3	1	0	4
4	22255E24B	Hard Core Elective –II	3	1	0	3
5	22255E25C	Hard Core Elective –III	3	1	0	3
6	22255L26	Core practical(Software Lab – Finite Element Analysis- ANSYS)	0	0	3	3
7	222TECWR	Technical writing / Seminars	0	0	3	3
TOTAL						24

SEMESTER – III

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255C31	Advanced Steel Structures	3	1	0	4
2	22255E32C	Hard Core Elective IV	3	1	0	3
3	22255E33A	Hard Core Elective V	3	1	0	3
4	22255E34B	Hard Core Elective VI	3	1	0	3
6	22255P35	Project Work Phase-I	0	0	6	10
TOTAL						23

SEMESTER – IV

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255P41	Project Work Phase-II	0	0	12	15
TOTAL						15

LIST OF ELECTIVES
Hard Core Elective-I

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E16A	Prestressed Concrete Design	3	1	0	3
2	22255E16B	Theory of Plates	3	1	0	3
3	22255E16C	Water Resource Engineering	3	1	0	3
4	22255E16D	Soil Structural Interaction	3	1	0	3
5	22255E16E	Remote Sensing Essentials	3	1	0	3

Hard Core Elective – II

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E24 A	Analysis And Design Of Tall Buildings	3	1	0	3
2	22255E24 B	Advanced Concrete Technology	3	1	0	3
3	22255E24 C	Soil Dynamics	3	1	0	3
4	22255E24 D	Rock Engineering	3	1	0	3
5	22255E24 E	Advanced Soil Mechanics	3	1	0	3

Hard Core Elective - III

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E25A	Design of sub structure	3	1	0	3
2	22255E25B	Advanced Foundation Engineering	3	1	0	3
3	22255E25 C	Elements of Earthquake Engineering	3	1	0	3
4	22255E25 D	Development and Applications of Special Concretes	3	1	0	3
5	22255E25 E	Vibration of Continuous Systems	3	1	0	3

Hard Core Elective-IV

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E32A	Optimization of Structures	3	1	0	3
2	22255E32B	Wind And Cyclone Effects On Structures	3	1	0	3
3	22255E32C	A seismic Design of Structures	3	1	0	3
4	22255E32D	Urban Transportation System Planning	3	1	0	3
5	22255E32E	Applied Seismology for Engineers	3	1	0	3

Hard Core Elective – V

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E33A	Prefabricated Structures	3	1	0	3
2	22255E33B	Design Of Bridges	3	1	0	3
3	22255E33C	Surface Water Hydrology	3	1	0	3
4	22255E33D	Unsaturated Soil Mechanics	3	1	0	3
5	22255E33E	Remote Sensing and GIS for rural development	3	1	0	3

Hard Core Elective – VI

S. No	Subject Code	Name of the Subject	L	T	P	C
1	22255E34A	Offshore Structures	3	1	0	3
2	22255E34B	Structural Dynamics	3	1	0	3
3	22255E34C	Water Supply Engineering	3	1	0	3
4	22255E34D	Water and waste water treatment	3	1	0	3
5	22255E34E	Applied Environmental Microbiology	3	1	0	3

COURSE STRUCTURE
M.TECH PT STRUCTURAL R2022

SEMESTER– I

S.No	Sub.Code	Name ofthe Subject	L	T	P	C
1	22248S11EP	Advanced Engineering Mathematics	3	1	0	4
2	22255C12P	Quality Control & Assurance in Construction	3	1	0	4
3	22255C13P	Theory of Plasticity and Elasticity	3	1	0	4
4	22255L14P	Computer Programming Lab	0	0	3	3
TOTAL						15

SEMESTER–II

S.No	Sub.Code	Name of the Subject	L	T	P	C
1	22255C21P	Management Information System	3	1	0	4
2	22255C22P	Finite Element Analysis	3	1	0	4
3	22255E23-P	Elective I	3	1	0	3
4	22255L24P	Software Lab– ANSYS	0	0	3	3
5	222TECWRP	Technical Writing/Seminars	0	0	3	3
TOTAL						17

SEMESTER–III

S.No	Sub.Code	Name oftheSubject	L	T	P	C
1	22255C31P	Structural Dynamics	3	1	0	4
2	22255C32P	Maintenance and Rehabilitation of Structures	3	1	0	4
3	22255E33-P	Elective II	3	1	0	3
TOTAL						11

SEMESTER–IV

S.No	Sub.Code	Name ofthe Subject	L	T	P	C
1	22255C41P	Advanced Concrete Structural design	3	1	0	4
2	22255C42P	Advanced Steel Structures	3	1	0	4
3	22255E43-P	Elective III	3	1	0	3
4	22255P44P	Project Work Phase I	0	0	6	10
Total Credits						21

SEMESTER– V

S.No	Sub.Code	Name ofthe Subject	L	T	P	C
1	22255E51-P	Elective IV	3	1	0	3
2	22255E52-P	Elective V	3	1	0	3
3	22255E53-P	Elective VI	3	1	0	3
TOTAL						9

SEMESTER–VI

S.No	Sub.Code	Name ofthe Subject	L	T	P	C
1	22255P61P	Project Work Phase II	0	0	12	15
Total Credits						15

LIST OF ELECTIVES SEMESTER II

Elective-I

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E23AP	Theory Of Plates	3	1	0	3
2	22255E23BP	Advanced Concrete Technology	3	1	0	3
3	22255E23CP	Water Resource Engineering	3	1	0	3
4	22255E23DP	Soil Structural Interaction	3	1	0	3
5	22255E23EP	Remote Sensing Essentials	3	1	0	3

SEMESTER III

Elective- II

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E33AP	Prestressed Concrete Design	3	1	0	3
2	22255E33BP	Analysis And Design Of Tall Buildings	3	1	0	3
3	22255E33CP	Soil Dynamics	3	1	0	3
4	22255E33DP	Rock Engineering	3	1	0	3
5	22255E33EP	Advanced Soil Mechanics	3	1	0	3

SEMESTER IV

Elective-III

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E43AP	Design of Sub Structures	3	1	0	3
2	22255E43BP	Advanced Foundation Engineering	3	1	0	3
3	22255E43CP	Elements Of Earthquake Engineering	3	1	0	3
4	22255E43DP	Development and Applications of Special Concretes	3	1	0	3
5	22255E43EP	Vibration of Continuous Systems	3	1	0	3

SEMESTER V

Elective-IV

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E51AP	Optimization of Structures	3	1	0	3
2	22255E51BP	Wind And Cyclone Effects On Structures	3	1	0	3
3	22255E51CP	A seismic Design of Structures	3	1	0	3
4	22255E51DP	Urban Transportation System Planning	3	1	0	3
5	22255E51EP	Applied Seismology for Engineers	3	1	0	3

Elective–V

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E52A	Prefabricated Structures	3	1	0	3
2	22255E52BP	Design of Bridges	3	1	0	3
3	22255E52CP	Remote Sensing and GIS for rural development	3	1	0	3
4	22255E52DP	Surface Water Hydrology	3	1	0	3
5	22255E52EP	Unsaturated Soil Mechanics	3	1	0	3

Elective-VI

S. No	Sub. Code	Name of the Subject	L	T	P	C
1	22255E53AP	Offshore Structures	3	1	0	3
2	22255E53BP	Structural Dynamics	3	1	0	3
3	22255E53CP	Water Supply Engineering	3	1	0	3
4	22255E53DP	Water and waste water treatment	3	1	0	3
5	22255E53EP	Applied Environmental Microbiology	3	1	0	3

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 - 2022)

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues				
			Gender Sensitization and Human Values	Professional Ethics and Human Values	Environment and Sustainability and Human Values	Human Values	Professional Ethics
B.Tech - 22UGMECHPT	22148S11P	Transforms & Partial Differential Equations	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C12P	Electrical drives and controls	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C13P	Engineering Thermodynamics	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C14P	Fluid Mechanics and Machinery	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C15P	Manufacturing Technology - I	-	-	-	-	-
B.Tech - 22UGMECHPT	22148S21P	Numerical Methods	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C22P	Manufacturing Technology - II	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C23P	Thermal Engineering	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C24P	Strength of Materials	-	-	-	-	-

B.Tech - 22UGMECHPT	22154C25P	Engineering Materials and Metallurgy	-	-	-	-	-
B.Tech - 22UGMECHPT	22148S31CP	Probability and Statistics	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C32P	Kinematics of Machinery	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C33P	Computer Aided Design and Manufacturing	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C34P	Engineering Metrology and Measurements	-	-	-	-	-
B.Tech - 22UGMECHPT	22154L35P	Computer Aided Simulation and Analysis Laboratory	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C41P	Professional Ethics	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C42P	Dynamics of Machinery	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C43P	Design of Machine Elements	-	-	-	-	-
B.Tech - 22UGMECHPT	22154E44DP	Renewable Sources of Energy	-	-	-	-	-
B.Tech - 22UGMECHPT	22154L45P	Dynamics Laboratory	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C51P	Heat and Mass Transfer	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C52P	Design of Transmission Systems	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C53P	Safety in Process Industries	-	-	-	-	-
B.Tech - 22UGMECHPT	22154E54CP	Robotics	-	-	-	-	-
B.Tech - 22UGMECHPT	22154L55P	Heat Transfer Laboratory	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C61P	Finite Elements Analysis	-	-	-	-	-

B.Tech - 22UGMECHPT	22154C62P	Mechatronics	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C63P	Maintenance Engineering	-	-	-	-	-
B.Tech - 22UGMECHPT	22154E64AP	Principles of Management	-	-	-	✔	-
B.Tech - 22UGMECHPT	22154L65P	Mechatronics Laboratory	-	-	-	-	-
B.Tech - 22UGMECHPT	22160S71P	Total Quality Management	-	-	-	✔	-
B.Tech - 22UGMECHPT	22154C72P	Process Planning and Cost Estimation	-	-	-	-	-
B.Tech - 22UGMECHPT	22154C73P	Advanced I.C. Engines	-	-	-	-	-
B.Tech - 22UGMECHPT	22154E74CP	Unconventional Machining Process	-	-	-	-	-
B.Tech - 22UGMECHPT	22154P75P	Project Work	-	-	-	-	-
M.Tech - 22PGMFTFT	22248S11	Advanced Engineering Mathematics	-	-	-	-	-
M.Tech - 22PGMFTFT	22254C12	Theory of Metal Cutting	-	-	-	-	-
M.Tech - 22PGMFTFT	22254C13	Advanced Manufacturing Processes	-	-	-	-	-
M.Tech - 22PGMFTFT	22254C14	Advances in Casting & Welding	-	-	-	-	-
M.Tech - 22PGMFTFT	22254C15	Automated Computer Integrated Manufacturing Systems	-	-	-	-	-
M.Tech - 22PGMFTFT	22254E16A	Materials Management and Logistics	-	-	-	-	-
M.Tech - 22PGMFTFT	22254L17	CAD/CAM Laboratory	-	-	-	-	-
M.Tech -	22254C21	Tooling for Manufacturing	-	-	-	-	-

22PGMFTFT							
M.Tech - 22PGMFTFT	22254C22	MEMS and Nano Technology	-	-	-	-	-
M.Tech - 22PGMFTFT	22254C23	Manufacturing Metrology and Quality Control	-	-	-	-	-
M.Tech - 22PGMFTFT	22254E24B	Lean Manufacturing	-	-	-	-	-
M.Tech - 22PGMFTFT	22254E25B	Maintenance Management	-	-	-	-	-
M.Tech - 22PGMFTFT	22254L26	Automation Lab	-	-	-	-	-
M.Tech - 22PGMFTPT	22248S11EP	Advanced Engineering Mathematics	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C12P	Theory of Metal Cutting	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C13P	Advanced Manufacturing Processes	-	-	-	-	-
M.Tech - 22PGMFTPT	22254L14P	CAD/CAM Laboratory	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C21P	Tooling for Manufacturing	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C22P	MEMS and Nano Technology	-	-	-	-	-
M.Tech - 22PGMFTPT	22254E23BP	Lean Manufacturing	-	-	-	-	-
M.Tech - 22PGMFTPT	22254L24P	Automation Lab	-	-	-	-	-
M.Tech - 22PGMFTPT	222TECWRP	Technical Writing/Seminar	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C31P	Advances in Casting and Welding	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C32P	Automated Computer Integrated Manufacturing Systems	-	-	-	-	-

M.Tech - 22PGMFTPT	22254E33CP	Manufacturing Information Systems	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C41P	Manufacturing Metrology and Quality Control	-	-	-	-	-
M.Tech - 22PGMFTPT	22254C42P	Metal Forming Process	-	-	-	-	-
M.Tech - 22PGMFTPT	22254E43BP	Maintenance Management	-	-	-	-	-
M.Tech - 22PGMFTPT	22254P44P	Project Work Phase - I	-	-	-	-	-
M.Tech - 22PGMFTPT	22254E51BP	Instrumentation and Control Engineering	-	-	-	-	-
M.Tech - 22PGMFTPT	22254E52BP	Fluid Power Automation	-	-	-	-	-
M.Tech - 22PGMFTPT	22254E53AP	Advanced Material Technology	-	-	-	-	-
M.Tech - 22PGMFTPT	22254P61P	Project Work Phase - II	-	-	-	-	-

PRIST
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NAAC ACCREDITED
THANJAVUR – 613 403 - TAMIL NADU

DEPARTMENT OF MECHANICAL ENGINEERING

PROGRAMME HANDBOOK

M.Tech. – Manufacturing Technology

FULL TIME PROGRAMME

Regulation 2022

(For candidates admitted to M.Tech Manufacturing Technology Programme from June 2022 onwards)

COURSE STRUCTURE

Semester - 1

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22248S11	Advanced Engineering Mathematics	3	1	-	4
22254C12	Theory of Metal Cutting	4	-	-	4
22254C13	Advanced Manufacturing Processes	4	-	-	4
22254C14	Advances in Casting & Welding	4	-	-	4
22254C15	Automated Computer Integrated Manufacturing Systems	4	-	-	4
22254E16 (A To C)	Elective – I	3	-	-	3
22254L17	CAD/CAM Laboratory	-	-	3	3
TOTAL NO. OF CREDITS					**26**

Semester – 2

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254C21	Tooling for Manufacturing	4	-	-	4
22254C22	MEMS and Nano Technology	4	-	-	4
22254C23	Manufacturing Metrology and Quality Control	4	-	-	4
22254E24 (A to C)	Elective – II	3	-	-	3
22254E25 (A to C)	Elective – III	3	-	-	3
22254L26	Automation Lab	-	-	3	3
222TECWR	Technical Writing/Seminar	-	-	3	3
TOTAL NO. OF CREDITS					**24**

Semester - 3

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254C31	Metal Forming Process	4	-	-	4
22254E32 (A to C)	Elective – IV	3	-	-	3
22254E33 (A to B)	Elective - V	3	-	-	3
22254E34 (A to B)	Elective - VI	3	-	-	3
22254P35	Project Work Phase I	-	-	10	10
TOTAL NO. OF CREDITS					**23**

Semester – 4

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254P41	Project Work Phase II	-	-	15	15
TOTAL NO. OF CREDITS					**15**

ELECTIVE –I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E16A	Materials Management and Logistics	3	-	-	3
22254E16B	Quality And Reliability Engineering	3	-	-	3
22254E16C	Manufacturing Information Systems	3	-	-	3

ELECTIVE –II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E24A	Finite Element Application in Manufacturing	3	-	-	3
22254E24B	Lean Manufacturing	3	-	-	3
22254E24C	Material management	3	-	-	3

ELECTIVE –III

Course Code	Title of Paper	L	T	P	C
22254E25A	Non-Destructive Testing And Evaluation	3	-	-	3
22254E25B	Maintenance Management	3	-	-	3
22254E25C	Optimization Techniques	3	-	-	3

ELECTIVE –IV

22254E32A	Process Planning And Cost Estimation	3	-	-	3
22254E32B	Instrumentation and Control Engineering	3	-	-	3
22254E32C	Research Methodology	3	-	-	3

ELECTIVE -V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E33A	Product Design and Development	3	-	-	3
22254E33B	Fluid Power Automation	3	-	-	3
22254E33C	Internet Of Things For Manufacturing	3	-	-	3

ELECTIVE -VI

22254E34A	Advanced Material Technology	3	-	-	3
22254E34B	Industrial Safety	3	-	-	3
22254E34C	Additive Manufacturing	3	-	-	3

Total No of Credits - 88

***Gender Sensitization and Human Values**
***Human Values**
***Professional Ethics**
***Environment and Sustainability**
***Professional Ethics& Human Values**

DEPARTMENT OF MECHANICAL ENGINEERING

M.Tech., MANUFACTURING TECHNOLOGY – FULL TIME PROGRAMME SYLLABI-REGULATIONS- 2022

I - SEMESTER

22248S11E - ADVANCED ENGINEERING MATHEMATICS 3 1 0 4

LAPLACE TRANSFORM: **9+3**

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

FOURIER TRANSFORM: **9+3**

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

PROBABILITY OF DISTRIBUTION: **9+3**

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

TESTING OF HYPOTHESIS: **9+3**

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

THEORY OF ESTIMATION **9+3**

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

TOTAL: 45+30 = 75 PERIODS

BOOKS FOR REFERENCES:

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.

2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996

3. Engineering Statistics, Bowher and LIberman

4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999.

22254C12 - THEORY OF METAL CUTTING **4 0 0 4**

OBJECTIVE:

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

UNIT- I: Orthogonal Cutting: **12**

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

UNIT-II: Chip Formation: **12**

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

UNIT-III : Tool Life and Machinability: **12**

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

UNIT-IV: Thermal Analysis in Metal Cutting: **12**

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

UNIT-V: Chatter: **12**

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

TOTAL: 60 PERIODS

BOOKS FOR REFERENCES:

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

22254C13 ADVANCED MANUFACTURING PROCESSES 4 0 0 4

AIM:

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

OBJECTIVE:

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

UNIT I NEWER MACHINING PROCESSES - I 12

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

UNIT II NEWER MACHINING PROCESS – II 12

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

UNIT III NEWER MACHINING PROCESS – III 12

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

UNIT IV FABRICATION OF MICRO DEVICES 12

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

UNIT V MICROFABRICATION TECHNOLOGY 12

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

TOTAL: TOTAL: 60 PERIODS

BOOKS FOR REFERENCES:

1. Serope 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., 1980
7.More Madon, Fundamentals of Micro fabrication, CRC Press

22254C14

ADVANCES IN CASTING AND WELDING L T P C 3 0 0 3

OBJECTIVES:

 To study the metallurgical concepts and applications of casting and welding process.

 To acquire knowledge in CAD of casting and automation of welding process.

UNIT I CASTING DESIGN 8

Heat transfer between metal and mould — Design considerations in casting – Designing for directional solidification and minimum stresses - principles and design of gating and risering

UNIT II CASTING METALLURGY 8

Solidification of pure metal and alloys – shrinkage in cast metals – progressive and directional solidification — Degasification of the melt-casting defects – Castability of steel , Cast Iron, Al alloys, Babbit alloy and Cu alloy.

UNIT III RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT 8

Shell moulding, precision investment casting, CO2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry — Computer aided design of casting.

UNIT IV WELDING METALLURGY AND DESIGN 10

Heat affected Zone and its characteristics – W eldability of steels, cast iron, stainless steel, aluminum, Mg , Cu , Zirconium and titanium alloys – Carbon Equivalent of Plain and alloy steels Hydrogen embrittlement – Lamellar tearing – Residual stress – Distortion and its control . Heat transfer and solidification - Analysis of stresses in welded structures – pre and post welding heat treatments – weld joint design – welding defects – Testing of weldment.

. **UNIT V RECENT TRENDS IN WELDING 11**

Friction welding, friction stir welding – explosive welding – diffusion bonding – high frequency induction welding – ultrasonic welding – electron beam welding – Laser beam welding –Plasma welding – Electro slag welding- narrow gap, hybrid twin wire active TIG – Tandem MIG- modern brazing and soldering techniques – induction, dip resistance, diffusion processes – Hot gas, wave and vapour phase soldering. Overview of automation of welding in aerospace, nuclear, surface transport vehicles and under water welding.

OUTCOMES:

At the end of this course the students are expected to impart knowledge on basic concepts and advances in casting and welding processes.

TOTAL: 45 PERIODS

REFERENCES:

1. ASM Handbook vol.6, welding Brazing & Soldering, 2003
2. ASM Handbook, Vol 15, Casting, 2004
3. Carrry B., Modern Welding Technology, Prentice Hall Pvt Ltd., 2002
4. CORNU.J. Advanced welding systems – Volumes I, II and III, JAICO Publishers, 1994.

5. HEINELOPER & ROSENTHAL, Principles of Metal Casting, Tata McGraw Hill, 2000.
6. IOTROWSKI – Robotic welding – A guide to selection and application – Society of mechanical Engineers, 1987.
7. Jain P.L., Principles of Foundry Technology, Tata McGraw Hill Publishers, 2003
8. LANCASTER.J.F. – Metallurgy of welding – George Alien & Unwin Publishers, 1980
9. Parmer R.S., Welding Engineering and Technology, Khanna Publishers,2002
10. SCHWARIZ, M.M. – Source book on innovative welding processes – American Society for Metals (OHIO), 1981
11. Srinivasan N.K., Welding Technology, Khanna Tech Publishers, 2002

22254C15 AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS 4 0 0 4

AIM:

To stress the role of computers in production.

OBJECTIVE:

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

UNIT I INTRODUCTION 10

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

UNIT II AUTOMATED MANUFACTURING SYSTEMS 14

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

UNIT III GROUP TECHNOLOGY AND FMS 14

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

UNIT IV PROCESS PLANNING 12

Process planning – Activities in process planning, Information's required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes – selecting among casting process, forming process and machining process. Sequencing of operations according to Anteriorities – various examples – forming of Matrix of Anteriorities – case study. Typical process sheet – case studies in Manual process planning. Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning.

UNIT V TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE 10

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

TOTAL: 60 PERIODS

BOOKS FOR REFERENCES:

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

22254L19 CAD / CAM LABORATORY 0 0 3 3

OBJECTIVES:

 To teach the students about the drafting of 3D components and analyzing the same using various CAD packages and programming of CNC machines

 To train them to use the various sensors

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. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.

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: 60 PERIODS

OUTCOMES :

At the end of this course the students are expected

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

LIST OF EQUIPMENTS S.NO	**EQUIPMENT**	**QUANTITY**
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	15 licenses

	Programming and tool path simulation for FANUC / Sinumeric and Heidenhain controller)	
9.	Licensed operating system	adequate
10.	Support for CAPP	adequate

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

22254C21 TOOLING FOR MANUFACTURING 4 0 0 4

OBJECTIVES:

 To study the various design considerations for tooling.

 Develop knowledge in tooling and work holding devices

UNIT I INTRODUCTION 12

Manufacturing Processes-objectives of manufacturing processes-classification of manufacturing process-Objectives of Tool design-tool design process-Nature and scope of Tool engineering-principles of economy for tooling-problems of economy in tooling-planning and tooling for economy-Manufacturing principles applicable to process and tool planning-tool control-tool maintenance-tool materials and its selection

UNIT II TOOLING FOR METAL REMOVAL PROCESSES 12

Traditional machining processes -work and tool holding devices-tool nomenclatures-Mechanism of machining-force temperature and tool life of single point tool-multipoint tools -tool design-tool wear-special processes-capstan and turret lathe-tooling layout of automats-tooling in NC and CNC machines-tooling for machining centres-CAD in tool design-Jigs and fixtures-design-Non-traditional material removal processes-mechanical, electrical thermal and chemical energy processes-principles-operation-equipment-tooling parameters and limitations

UNIT III TOOLING FOR METAL FORMING PROCESSES 12

Classification of Forming processes-Types of presses-design of -blanking and piercing dies-simple, compound, combination and progressive dies-Drawing dies-Bending dies-forging dies-plastic moulding dies

UNIT IV TOOLING FOR METAL CASTING AND METAL JOINING PROCESSES 12

Tools and Equipment for moulding-patterns –pattern allowances – pattern construction-die casting tools-mechanization of foundries. Tooling for Physical joining processes Design of welding fixtures – Arc welding, Gas welding, Resistance welding, laser welding fixtures-Tooling for Soldering and Brazing Tooling for Mechanical joining processes

UNIT V TOOLING FOR INSPECTION AND GAUGING 12

Survey of linear and angular measurements-standards of measurement-design and manufacturing of gauges- measurement of form-Inspection bench centre-co-ordinate measuring machine-tooling in CMM.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of this course the students are well versed in

1. State of Art in Tooling in Manufacturing and Inspection
2. Design and Develop tooling for Flexible Manufacturing

REFERENCES:

1. Cyril Donaldson Tool Design, Tata McGraw Hill, 1976

2. Hoffman E.G Fundamentals of tool design SME 1984.
3. Kalpak Jian S., Manufacturing Engineering and Technology Addison Wesley 1995.
4. L E Doyle Tool Engineering Prentice Hall 1950
5. Wellar, J Non-Traditional Machining Processes, SME, 1984

22254C22 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 10

Definition – historical development – fundamentals – properties, micro fluidics, design and fabrication micro-system, microelectronics, working principle and applications of micro system.

UNIT II MATERIALS, FABRICATION PROCESSES AND MICRO SYSTEM PACKAGING 14

Substrates and wafers, silicon as substrate material, mechanical properties of Si, Silicon Compounds silicon piezo resistors, 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 12

Sensors – classification – signal conversion ideal characterization of sensors micro actuators, mechanical sensors – measurands displacement sensors, pressure and flow sensors, micro actuators – smart materials – applications.

UNIT IV SCIENCE OF NANO MATERIALS 12

Classification of nano structures – effect of the nanometer length scale effects of nano scale dimensions on various properties – structural, thermal, chemical, mechanical, magnetic, optical and electronic properties – effect of nanoscale dimensions on biological systems. Fabrication methods – Top down processes – bottom up process.

UNIT V CHARACTERIZATION OF NANO MATERIALS 12

Nano-processing systems – Nano measuring systems – characterization – analytical imaging techniques – microscopy techniques, electron microscopy scanning electron microscopy, transmission electron microscopy, transmission electron microscopy, scanning tunneling microscopy, atomic force microscopy, diffraction techniques – spectroscopy techniques – Raman spectroscopy, 3D surface analysis – Mechanical, Magnetic and thermal properties – Nano positioning systems.

TOTAL: 60 PERIODS

BOOKS FOR REFERENCES:

1. Tai – Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.
2. Mark Madou Fundamentals of Microfabrication, CRC Press, New York, 1997.
3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003
4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.
5. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003
6. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

22254C23 MANUFACTURING METROLOGY AND QUALITY CONTROL 4 0 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 11

Introduction – types of lasers – laser in engineering metrology – metrological laser methods for applications in machine systems – Interferometry applications – speckle interferometry – laser interferometers in manufacturing and machine tool alignment testing – calibration systems for industrial robots laser Doppler technique – laser Doppler anemometry.

UNIT – II PRECISION INSTRUMENTS BASED ON LASER 11

Laser telemetric systems – detection of microscopic imperfections on high quality surface Pitter NPL gauge interferometer – classification of optical scanning systems – high inertia laser scan technique – rotating mirror technique – laser gauging – bar coding – laser dimensional measurement system.

UNIT – III CO-ORDINATE MEASURING MACHINE 14

Co-ordinate metrology – CMM configurations – hardware components – software – Probe sensors – displacement devices – Performance Evaluations – Software – Hardware – Dynamic errors – Thermal effects diagram – temperature variations environment control – applications.

UNIT – IV OPTO ELECTRONICS AND VISION SYSTEM 12

Opto electronic devices – CCD – On-line and in-process monitoring in production – applications image analysis and computer vision – Image analysis techniques – spatical feature – Image extraction – segmentation – digital image processing – Vision system for measurement – Comparison laser scanning with vision system.

UNIT – V QUALITY IN MANUFACTURING ENGINEERING 12

Importance of manufacturing planning for quality – concepts of controllability – need for quality management system and models – quality engineering tools and techniques – statistical process control – six sigma concepts – Poka Yoke – Computer controlled systems used in inspection.

TOTAL: 60 PERIODS

REFERENCES:

1. John A. Bosch, Giddings and Lewis Dayton, Co-ordinate Measuring Machines and Systems, Marcel Dekker, Inc, 1999.

2. Juran J.M. and Gyna F.M., Quality Planning and Analysis, Tata-McGraw Hill, New Delhi
3. Zuech, Nello Understanding and Applying Machine Vision, Marcel Dekker, Inc, 2000
4. Elanchezhian.C, Vijaya Ramnath.B and Sunder Selwyn, T., Engineering Metrology, Eswar Press, Chennai, 2004.

22254L26 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

222TECWR 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.

SEMESTER III

22254C31 **METAL FORMING PROCESS** **4 0 0 4**

OBJECTIVE:

To study about the response of materials under plastic deformation and the various techniques for finding the stress for various metal working processes, and the recent developments in high speed forming.

UNIT-I: Stress and Strain: **10**

Stress-State of stress in two dimensions – three dimensions – stress tensor-Mohr's circles – 2D and 3D state of stress – Description of strain at a point – Mohr's circle of strain- Hydrostatic and stress deviator component of stress- Plasticity- flow curve- true and true strain yield criteria for ductile loads combined stress test-plastic stress and strain relations- Levy Mises equations-Prandyl_Resus equations.

UNIT-II: Analysis of Metal Forming: **14**

Work Load analysis – work formula for homogeneous deformation- rolling, rod drawing and extrusion processes -Determination of load by stress evaluation method-Determination of drawing load – strip drawing with wedge shaped dies and cylindrical rod drawing with a conical die.

UNIT-III: Stress Evaluation: **12**

Stress evaluation method-Determination of forging load-plane strain forging of a thin strip and a flat circular disc- Determination of extrusion load for round band flat strip- upper bound analysis – plane strain indentation with frictionless interface

UNIT-IV: High velocity Forming: **12**

Study of effect of high speed on stress strain relationships- High velocity forming equipment-Description of high speed forming machine – hot forging, pneumatic-mechanical, high velocity forging – Fuel combustion process- Electro magnetic forming –Introduction- Procedure - process variables-Applications

UNIT-V: Advanced Forming process: **12**

Explosive Forming – Explosives – characteristics- stand off and contact operations- stress waves and their effects- process variables – properties of formed components- applications- Electro hydraulic forming – principles, requirements and characteristics – process variables- water hammer forming-principles and parameters- governing the process.

BOOKS FOR REFERENCES:

1. George E.Dieter, "Mechanical Metallurgy", Mc Graw Hill International Edition, New York,1988
2. Rowe G.W,Edward , "An Introduction to the Principles of Metal Working", Edward Arnold publications.
3. Davies.R and Austin.E.R, "Developments in High Metal Forming", The Machinery Publishing Co.Ltd

4. Robert H.Wagoner and Jean Loup Chenot, "Fundamentals of Metal Forming", John Wiley and Sons Inc, New York,1992

List of Electives - Elective I

22254E16A MATERIALS MANAGEMENT AND LOGISTICS 3 0 0 3

AIM:

To introduce to the students the various functions of materials management and logistics

OBJECTIVE:

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

UNIT I INTRODUCTION 6

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II MANAGEMENT OF PURCHASE 7

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

UNIT III MANAGEMENT OF STORES AND LOGISTICS 12

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

UNIT IV MATERIALS PLANNING 10

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

UNIT V INVENTORY MANAGEMENT 10

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45 periods

BOOKS FOR REFERENCES:

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. 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.

22254E16B QUALITY AND RELIABILITY ENGINEERING 3 0 0 3

OBJECTIVES:

To make the students to understand the various quality control techniques and to construct the various quality control charts for variables and attributes and also the design concepts for reliable system and maintenance aspects in industries.

UNIT I QUALITY & STATISTICAL PROCESS CONTROL 8

Quality – Definition – Quality Assurance – Variation in process – Factors – process capability – control charts – variables X, R and X, - Attributes P, C and U-Chart tolerance design. Establishing and interpreting control charts – charts for variables – Quality rating – Short run SPC.

UNIT II ACCEPTANCE SAMPLING 8

Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling plans – OC curves – Producer's risk and consumer's risk. AQL, LTPD, AOQL, Concepts – standard sampling plans for AQL and LTPD – use of standard sampling plans.

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD 9

Fundamentals – factorial experiments – random design, Latin square design – Taguchi method – Loss function – experiments – S/N ratio and performance measure – Orthogonal array.

UNIT IV CONCEPT OF RELIABILITY 9

Definition – reliability vs quality, reliability function – MTBF, MTTR, availability, bathtub curve – time dependent failure models – distributions – normal, weibull, lognormal – Reliability of system and models – serial, parallel and combined configuration – Markove analysis, load sharing systems, standby systems, covarient models, static models, dynamic models.

UNIT V DESIGN FOR RELIABILITY AND MAINTAINABILITY 11

Reliability design process, system effectiveness, economic analysis and life cycle cost, reliability allocation, design methods, parts and material selection, derating, stress-strength and analysis, failure analysis, identification determination of causes, assessments of effects, computation of criticality index, corrective action, system safety – analysis of down-time – the repair time distribution, stochastic point processes system repair time, reliability under preventive maintenance state dependent system with repair. MTTR – mean system down time, repair vs replacement, replacement models, proactive, preventive, predictive maintenance maintainability and availability, optimization techniques for system reliability with redundancy heuristic methods applied to optimal system reliability.

TOTAL: 45 PERIODS

Text Books:

1. Statistical Process Control, by Eugene Grant, Richard Leavenworth, McGraw Hill.
2. Quality Engineering in Production Systems, by G Taguchi , McGraw Hill, 1989.
3. Optimization &Variation Reduction in Quality, byW.A. Taylor,Tata McGraw Hill, 1991.

Reference Books:

1. Jurans Quality Planning and Analysis, by Frank. M.Gryna Jr. McGrawHill
2. Taguchi Techniques for Quality Engineering, (2ndEdition) by Philipposs, McGraw Hill, 1996,.

3. Reliability Engineering, (3rdEdition), by LS Srinath, Affiliated East West Pvt Ltd, 1991.

4. Reliability Engineering, by E.Bala Guruswamy, Tata McGraw Hill, 1994

OUTCOMES :

At the end of this course the students are exposed to the various quality control techniques , to understand the importance and concept of reliability and maintainability in industries.

REFERENCES:

1. Amata Mitra “Fundamentals of Quality Control and improvement” Pearson Education, 2002.
2. Bester field D.H., “Quality Control” Prentice Hall, 1993.
3. Charles E Ebling, An Introduction to Reliability and Maintability Engineering, Tata-McGraw Hill, 2000.
4. David J Smith, Reliability, Maintainability and Risk: Practical Methods for Engineers, Butterworth 2002.
5. Dhillon, Engineering Maintainability – How to design for reliability and easy maintenance, PHI, 2008.
6. Patrick D To’ corner, Practical Reliability Engineering, John-Wiley and Sons Inc, 2002

22254E16C **MANUFACTURING INFORMATION SYSTEMS** **3 0 0 3**

AIM:

To impart the knowledge in manufacturing information system.

OBJECTIVE:

On completion of this course, the students are expected to be conversant with order policies, data base terminologies, designing, manufacturing considerations and information system for manufacturing.

UNIT I INTRODUCTION **5**

The Evolution of order policies, from MRP to MRP II, the role of Production organization, Operations control.

UNIT II DATABASE **7**

Terminologies – Entities and attributes – Data models, schema and subschema - Data Independence – ER Diagram – Trends in database.

UNIT III DESIGNING DATABASE **13**

Hierarchical model – Network approach- Relational Data model concepts, principles, keys, relational operations – functional dependence – Normalization types – Query.

UNIT IV MANUFACTURING CONSIDERATION **10**

The product and its structure, inventory and process flow – Shop floor control Data structure and procedure – various model – the order scheduling module, Input/output analysis module the stock status database – the complete IOM database.

UNIT V INFORMATION SYSTEM FOR MANUFACTURING **10**

Parts oriented production information system – concepts and structure – Computerized production scheduling, online production control systems; Computer based production management system, computerized manufacturing information system – case study.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Luca G.Sartori, “Manufacturing Information Systems”, Addison-Wesley Publishing Company, 1988.
2. Date.C.J.,”An Introduction to Database Systems” Addison Wesley, 8th Edn,.2003
3. Orlicky.G., “Material Requirements Planning”, McGraw-Hill, 1994.
4. Kerr.R, “Knowledge based Manufacturing Management”, Addison-Wesley,1991.
5. Manufacturing Information & Data Systems Analysis, Design & Practice,CECELJA FRANJO, 2002.

List of Electives - Elective II

22254E24A FINITE ELEMENT APPLICATIONS IN MANUFACTURING 3 0 0 3

AIM:

To impart knowledge in the area of finite element methods and its application in manufacturing.

OBJECTIVE:

To study the fundamentals of one dimensional and two dimensional problems using FEA in manufacturing.

UNIT I INTRODUCTION 6

Fundamentals – Initial, boundary and eigen value problems – weighted residual, Galerkin and Raleigh Ritz methods - Integration by parts – Basics of variational formulation – Polynomial and Nodal approximation.

UNIT II ONE DIMENSIONAL ANALYSIS 10

Steps in FEM – Discretization. Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

UNIT III SHAPE FUNCTIONS AND HIGHER ORDER FORMULATIONS 10

Shape functions for one and two dimensional elements- Three noded triangular and four nodded quadrilateral element Global and natural co-ordinates—Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

UNIT IV COMPUTER IMPLEMENTATION 9

Pre Processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages – Development of code for one dimensional analysis and validation.

UNIT V ANALYSIS OF PRODUCTION PROCESSES 10

FE analysis of metal casting – special considerations, latent heat incorporation, gap element – Time stepping procedures – Crank – Nicholson algorithm – Prediction of grain structure – Basic concepts of plasticity and fracture – Solid and flow formulation – small incremental deformation formulation – Fracture criteria – FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency – FE analysis of welding.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Reddy, J.N. An Introduction to the Finite Element Method, McGraw Hill,1985.
2. Rao, S.S., Finite Element method in engineering, Pergammon press, 1989.
3. Lewis R.W.Morgan, K, Thomas, H.R. and Seetharaman, K.N. The Finite Element
Method in Heat Transfer Analysis, John Wiley, 1994.

22254E24B LEAN MANUFACTURING 3 0 0 3

AIM:

To introduce the concepts of lean manufacturing system.

OBJECTIVES:

- To study the various tools for lean manufacturing (LM).
- To apply the above tools to implement LM system in an organization.

UNIT – I INTRODUCTION TO LEAN MANUFACTURING 7

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

UNIT – II CELLULAR MANUFACTURING, JIT, TPM 9

Cellular Manufacturing – Types of Layout, Principles of Cell layout, Implementation. JIT – Principles of JIT and Implementation of Kanban. TPM – Pillars of TPM, Principles and implementation of TPM.

UNIT – III SET UP TIME REDUCTION, TQM, 5S, VSM 10

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT – IV SIX SIGMA 9

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

UNIT – V CASE STUDIES 10

Various case studies of implementation of lean manufacturing at industries.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Design and Analysis of Lean Production Systems, Ronald G. Askin & Jeffrey B. Goldberg, John Wiley & Sons, 2003

2. Rother M. and Shook J, 1999 'Learning to See: Value Stream Mapping to Add Value and Eliminate Muda' , Lean Enterprise Institute, Brookline, MA.

1. Mikell P. Groover (2002) ‘Automation, Production Systems and CIM.

22254E24C Materials Management 3 0 0 3

OBJECTIVE :

To introduce to the students the various concepts of materials management

UNIT I INTRODUCTION 6

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II MANAGEMENT OF PURCHASE 7

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

UNIT III MANAGEMENT OF STORES AND LOGISTICS 12

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

UNIT IV MATERIALS PLANNING 10

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

UNIT V INVENTORY MANAGEMENT 10

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of this course the students are

- Familiarized 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.

REFERENCES

1. Dr. R. Kesavan, C.Elanchezian and T.SundarSelwyn, Engineering Management – Eswar Press – 2005.
2. Dr.R. Kesavan, C.Elanchezian and B.Vijaya Ramnath, Production Planning and Control, Anuratha Publications, Chennai, 2008.
3. G. Reghuram, N. Rangaraj, Logistics and supply chain management – cases and concepts, Macmillan India Ltd., 2006.
4. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 2005.
5. Guptha P.K. and Heera, Operations Research, Suttan Chand & Sons, 2007.
6. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 2006.

List of Electives - Elective III

22254E25A NON-DESTRUCTIVE TESTING AND EVALUATION 3 0 0 3

OBJECTIVES :
To stress the importance of NDT in engineering.
UNIT I NON-DESTRUCTIVE TESTING: AN INTRODUCTION, VISUAL INSPECTION & LIQUID PENETRANT TESTING 6
Introduction to various non-destructive methods, Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.
Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods-water washable, Post – Emulsification methods, Applications
UNIT II EDDY CURRENT TESTING & ACOUSTIC EMISSION 10
Principles, Instrumentation for ECT, Absolute, differential probes, Techniques – High sensitivity techniques, Multi frequency, Phased array ECT, Applications.
Principle of AET, Instrumentation, Applications - testing of metal pressure vessels, Fatigue crack detection in aerospace structures.
UNIT III MAGNETIC PARTICLE TESTING & THERMOGRAPHY 10
Principle of MPT, procedure used for testing a component, Equipment used for MPT, Magnetizing techniques, Applications.
Principle of Thermography, Infrared Radiometry, Active thermography measurements, Applications – Imaging entrapped water under an epoxy coating, Detection of carbon fiber contaminants.
UNIT IV ULTRASONIC TESTING 10
Principle, Ultrasonic transducers, Ultrasonic Flaw detection Equipment, Modes of display A- scan, B-Scan, C- Scan, Applications, Inspection Methods - Normal Incident Pulse-Echo Inspection, Normal Incident Through-transmission Testing, Angle Beam Pulse-Echo testing, TOFD Technique, Applications of Normal Beam Inspection in detecting fatigue cracks, Inclusions, Slag, Porosity and Intergranular cracks - Codes, standards, specification and procedures and case studies in ultrasonics test.
UNIT V RADIOGRAPHY 9
Principle of Radiography, x-ray and gamma ray sources- safety procedures and standards, Effect of radiation on Film, Radiographic imaging, Inspection Techniques – Single wall single image, Double wall Penetration, Multiwall Penetration technique, Real Time Radiography - Codes, standards, specification and procedures and case studies in Radiography test.
Case studies on defects in cast, rolled, extruded, welded and heat treated components - Comparison and selection of various NDT techniques
TOTAL: 45 PERIODS
OUTCOMES:
At the end of this course the students are expected to have hands on experience on all types of NDT and their applications in Engineering.
REFERENCES:
1. Baldev Raj, Jeyakumar,T., Thavasimuthu,M., “Practical Non Destructive Testing” Narosa publishing house, New Delhi, 2002

2. Krautkramer. J., “Ultra Sonic Testing of Materials”, 1st Edition, Springer – Verlag Publication, New York, 1996.
3. Peter J. Shull “Non Destructive Evaluation: Theory, Techniques and Application” Marcel Dekker, Inc., New York, 2002
4. www.ndt.net

22254E25B MAINTENANCE MANAGEMENT 3 0 0 3

OBJECTIVE:

To understand the concepts of maintenance management and to have knowledge in developing a suitable maintenance system for any type of an organization.

UNIT I: Introduction to Maintenance Management: 7

Maintenance: Its role and scope in total Organizational contexts - role of Maintenance. Centralized and decentralized maintenance organization structures. Maintenance Economics – reliability and Availability – MTBF, MTTR.

UNIT II: Maintenance Categories: 10

Maintenance system– Categories - Design and its selection – Breakdown Maintenance –Routine Maintenance- Predictive Maintenance –Preventive Maintenance- Corrective Maintenance-Total Productive Maintenance –Maintenance Schedule – Repair Cycle.

UNIT III: Spare Parts Management: 8

Pareto's principles for repetitive breakdown analysis, spares management, planning considerations for each type of activities.

UNIT – IV: Condition Monitoring: 10

Condition Monitoring (CM) – Introduction- Economics of CM – On-load and off-load testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis.

UNIT V: Maintenance Manpower Cost, Performance Management: 10

Maintenance man power planning - Selection training - Scheduling maintenance costs - Budget preparation and budgetary control of maintenance expenditures Maintenance effectiveness various performance indices - evaluation, uses and limitations - Monitoring of Maintenance performance.

TEXT BOOKS FOR REFERENCES:

1. Gopalakrishnan P. and Sundarajan 1996. Maintenance Management. New Delhi, Prentice-Hall of India.
2. Srivastava S.K., "Industrial Maintenance Management", - S. Chand & Co.,1981.
3. Higgirs L.T and Morrow L.C., 1997, ``Maintenance Engineering Handbook``, McGraw Hill.
Armstrong, "Condition Monitoring", BSIRSA, 1988.

22254E25C **OPTIMIZATION TECHNIQUES** **3 0 0 3**

UNIT I - INTRODUCTION TO OPTIMIZATION **7**

Formulation of an optimization problem- Classification of optimization problem – optimization techniques- Classical optimization technique – Single variable optimization – Multi variable optimization algorithms

UNIT II - MINIMIZATION METHODS **8**

One dimensional minimization methods: unimodal function – elimination methods: unrestricted search, exhaustive search, Dichotomous search, Fibonacci methods, Golden section methods, Interpolation methods: Quadratic and cubic interpolation methods.

UNIT III - CONSTRAINED OPTIMIZATION TECHNIQUES **10**

Optimization with equality and inequality constraints - Direct methods – Indirect methods using penalty functions, Lagrange multipliers - separable programming and Geometric programming.

UNIT IV - UNCONSTRAINED OPTIMIZATION TECHNIQUES **10**

Multi variable unconstrained optimization techniques: Direct search methods: Random search method, unvaried method, pattern search method, steepest descent method and Conjugate gradient method.

UNIT V - APPLICATIONS OF HEURISTICS IN OPTIMIZATION **10**

Heuristics-Introduction-Multi objective optimization: Genetic algorithms and Simulated Annealing techniques; neural network & Fuzzy logic principles in optimization.

BOOKS FOR REFERENCES:

1. Rao, Singaresu, S., “Engineering Optimization – Theory & Practice”, New Age International (P) Limited, New Delhi, 2000.
2. Johnson Ray, C., “Optimum design of mechanical elements”, Wiley, John & Sons, 1990.
3. Kalyanamoy Deb, “Optimization for Engineering design algorithms and Examples”, Prentice Hall of India Pvt. 1995.
4. Goldberg, D.E., “Genetic algorithms in search, optimization and machine”, Barnen, Addison-Wesley, New York, 1989.

List of Electives - Elective IV

22254E32A PROCESS PLANNING AND COST ESTIMATION 3 0 0 3

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

UNIT I INTRODUCTION TO PROCESS PLANNING 10

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

UNIT II PROCESS PLANNING ACTIVITIES 10

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 8

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 8

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: At the end of this course the students are expected to use the concepts of process planning and cost estimation for various products.

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. Peter scalon, “Process planning, Design/Manufacture Interface”, Elsevier science technology Books, Dec 2002.
4. Russell R.S and Tailor B.W, “Operations Management”, 4th Edition, PHI, 2003.

22254E32B INSTRUMENTATION AND CONTROL ENGINEERING 3 0 0 3

UNIT–I: Introduction to Instrumentation: 8

Mechanical Instrumentation- General concepts, General measurement system. Classification of Instruments - indicators, recorders and integrators- working principles, Precision and Accuracy: Measurement Error and calibration.

UNIT–II: Measuring Devices 10

Measurement of speed, frequency, acceleration - Vibrometer, Accelerometer etc. Pressure measurement: Gravitational, Bourdon, elastic transducers, strain gauge, pressure cells, and measurement of high and low pressure. Temperature measurement: Bi-Metallic, Resistance Thermometer, Thermocouples, Pyrometer, thermostats, Magnetic flow meter , Ultrasonic flow meter.

UNIT – III: Transducers: 8

Transducers – Introduction – Types -Variable resistance Transducers-Variable reactive transducers- Piezo Electric transducers- Fibre optic transducers- Laser instrumentation-analogue and digital type -incremental and absolute measurement.

UNIT – IV: Machine Diagnostic and Condition Monitoring: 10

Machine Diagnostics – Basic Concepts - Analysis of failure in machines-Distribution of fault occurrences-Objectives of monitoring-Monitoring techniques applied to Machineries.

UNIT – V: Computer Control System: 9

Data acquisition system-Introduction-Direct Digital control-Programmable Logic Controls (PLC) -Ladder diagrams-Communication used in PLC.

BOOKS FOR REFERENCES:

1. Thomas Beckwith, Lewis Buck N.Ray, D. Maragoni, “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

22254CRM **RESEARCH METHODOLOGY**

AIM: **3 0 0 3**

To give an exposure to development of research questions and the various statistical methods suitable to address them through available literature, with basic computational operators.

OBJECTIVES:

- To understand the approaches towards and constraints in good research.
- To identify various statistical tools used in research methodology
- To appreciate and compose the manuscript for publication
- To train in basic computational and excel- skills for research in engineering.

OUTCOME:

Ability to develop research questions and the various research strategies, and compile research results in terms of journal manuscripts.

PREREQUISITES:

Research Methodology course in UG level or equivalent knowledge.

UNIT I **9**

Introduction to Research — Criteria of Good Research, Research Problem: Definition of research problem, selecting the problem - Necessity of defining the problem - Techniques involved in defining the problem-Basic principles of experimental designs-Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and Scaling – Different scales. Ethics & Misconduct in research, Plagiarism,

UNIT II **9**

Formulation of Hypothesis – Sampling techniques –Sampling error and sample size-Methods of data collection – Primary and secondary data – observation – Collection of literature, manual collection from library, usage of library, collection of literature from Scopus, Science Direct etc., compiling literature, software utilization in literature collection- Processing and analysis of data – editing – coding – transcription – tabulation –outline of statistical analysis.

UNIT III **9**

Data Analysis using Excel- Tabulation of Data in excel (Creating Master Table and Sub Table), Formulas and Functions, Filters and Sort and Validation Lists, Data from External Sources. Data Analysis Using Charts and Graphs(Pivot Table & Charts), Time Value of Money, Measure of central tendency: mean, median, mode, Measure of dispersion: variance, standard deviation, Coefficient of variation. Correlation, regression lines. Z-test, t- test F-test, ANOVA one way classification, Chi square test, independence of attributes. Time series: forecasting Method of least squares, Moving average method, Introduction to presentation tool, features and functions, Creating Presentation, Customizing presentation.

UNIT IV **9**

Various research methods-Design of Experiments, Response Surface Methodology, Taguchi Methods- Modeling & Simulation of Engineering Systems, Artificial Neural Networks, Fuzzy Logic, MATLAB - Graph Theory- Finite Element Methods, Computational Fluid Dynamics -R programming in Statistics- open source software

UNIT V **9**

Review of literature, Report writing – target audience – types of reports – contents of reports – styles and Conventions in reporting – steps in drafting a report. Basic concept of research paper writing for Journals and formats of publications in Journals, Report Structure - writing research abstract - introduction, review of literature, result, conclusions, Concepts of Bibliography and references

References:

1. C. R. Kothari, Research Methodology, New Age International Publishers. New Delhi, 2004.

2. Rajammal.P. Devadas, 1976, A hand book of methodology of research, RMM 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.

List of Electives - Elective V

22254E33A PRODUCT DESIGN AND DEVELOPMENT 3 0 0 3

UNIT I - INTRODUCTION 7

Significance of product design, product design and development process, sequential engineering design method, the challenges of product development.

UNIT II - PRODUCT PLANNING AND PROJECT SELECTION 8

Identifying opportunities evaluate and prioritize projects, allocation of resources Identifying Customer Needs, Interpret raw data in terms of customers need, organize needs in hierarchy and establish the relative importance of needs.

UNIT III - PRODUCT SPECIFICATIONS 8

Establish target specifications, setting final specifications, Concept Generation: Activities of concept generation, clarifying problem, search both internally and externally.

UNIT IV - INDUSTRIAL DESIGN AND CONCEPT SELECTION 10

Assessing need for industrial design, industrial design process, management, assessing quality of industrial design, Overview, concept screening and concept scoring, methods of selection.

UNIT V - THEORY OF INVENTIVE PROBLEM SOLVING (TRIZ) AND CONCEPT TESTING 12

Fundamentals, methods and techniques, General Theory of Innovation and TRIZ, Value engineering Applications in Product development and design, Model-based technology for generating innovative ideas Elements of testing: qualitative and quantitative methods including survey, measurement of customers' response, Intellectual Property: Elements and outline, patenting procedures.

BOOKS FOR REFERENCES:

1. Ulrich K. T, and Eppinger S.D, Product Design and Development, Tata McGraw Hill
2. Otto K, and Wood K, Product Design, Pearson
3. Engineering of creativity: introduction to TRIZ methodology of inventive Problem Solving, By Semyon D. Savransky, CRC Press.
4. Inventive thinking through TRIZ: a practical guide, By Michael A. Orloff, Springer.
5. Systematic innovation: an introduction to TRIZ ; (theory of inventive Problem Solving), By John Terninko, Alla Zusman, CRC Press.

22254E33B FLUID POWER AUTOMATION 3 0 0 3

AIM:

To impart knowledge in the area of hydraulics, pneumatic and fluid power components and its functions.

OBJECTIVE:

• To make the students to learn the basic concepts of hydraulics and pneumatics and their controlling elements in the area of manufacturing process.

• To train the students in designing the hydraulics and pneumatic circuits using ladder diagram.

UNIT I INTRODUCTION 5

Need for Automation, Hydraulic & Pneumatic Comparison – ISO symbols for fluid power elements, Hydraulic, pneumatics – Selection criteria.

UNIT II FLUID POWER GENERATING/UTILIZING ELEMENTS 8

Hydraulic pumps and motor gears, vane, piston pumps-motors-selection and specification-Drive characteristics – Linear actuator – Types, mounting details, cushioning – power packs – construction. Reservoir capacity, heat dissipation, accumulators – standard circuit symbols, circuit (flow) analysis.

UNIT III CONTROL AND REGULATION ELEMENTS 8

Direction flow and pressure control valves-Methods of actuation, types, sizing of ports pressure and temperature compensation, overlapped and under lapped spool valves operating characteristics-electro hydraulic servo valves-Different types-characteristics and performance.

UNIT IV CIRCUIT DESIGN 10

Typical industrial hydraulic circuits-Design methodology – Ladder diagram-cascade, method-truth table-Karnaugh map method-sequencing circuits-combinational and logic circuit.

UNIT V ELECTRO PNEUMATICS & ELECTRONIC CONTROL OF HYDRAULIC AND PNEUMATIC CIRCUITS 7

Electrical control of pneumatic and hydraulic circuits-use of relays, timers, counters, Ladder diagram. Programmable logic control of Hydraulics Pneumatics circuits, PLC ladder diagram for various circuits, motion controllers, use of field busses in circuits. Electronic drive circuits for various Motors.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCES:

1. Antony Esposito, Fluid Power Systems and control Prentice-Hall, 1988.
2. Peter Rohner, Fluid Power logic circuit design. The Macmillan Press Ltd.,London, 1979
3. E.C.Fitch and J.B.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.

22254E33C INTERNET OF THINGS FOR MANUFACTURING 3 0 0 3

OBJECTIVES:
 To discover key IoT concepts including identification, sensors, localization, wireless protocols
 To explore IoT technologies, architectures, standards, and regulation
 To realize the value created by collecting, communicating, coordinating, and leveraging data
 To examine developments that will likely shape the industrial landscape in the future;

UNIT I INTRODUCTION 9
Technology of the IoT and applications,. IoT data management requirements, Architecture of IoT, Security issues Opportunities for IoT -Issues in implementing IoT. Technological challenges, RFID and the Electronic Product Code (EPC) network, the web of things.
UNIT II DESIGN OF IoT 9
Design challenges in IoT -Standardization, Security and privacy, Infrastructure, Analytics. Design steps for implementing IoT.
UNIT III PROTOTYPING OF IoT 9
Design principles for connected devices -Embedded devices, physical design, online components, embedded coding system. Informed Manufacturing plant – Elements, IoT implementation in Transportation and logistics, Energy and utilities, Automotive Connected supply chain, Plant floor control automation, remote monitoring, Management of critical assets, Energy management and resource optimization, proactive maintenance.
UNIT IV PREREQUISITES FOR IoT 9
IOT Technologies Wireless protocols low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data-intensive IoT for continuous recognition applications Data storage and analysis Localization algorithms Localization for mobile systems
UNIT V APPLICATION IN MANUFACTURING 9
Applications HCI and IoT world -Multilingual interactions Robotics and Autonomous Vehicles Sensing and data processing-Simultaneous mapping and localization-Levels of autonomy, Smart factories, Future research challenges
TOTAL : 45 PERIODS

OUTCOMES:
 At the end of this course the students are expected to
 Utilizing sensors to gain greater visibility and real-time situational awareness
 Vertical applications that provide a clear business case and a pressing opportunity
 Emerging technologies to address IoT challenges

REFERENCES:
1. Adrian McEwan and Hakim Cassimally, “Designing the internet of things”, Wiley, 2013
2. Code Halos: How the Digital Lives of People, Things, and Organizations are Changing the Rules of Business, by Malcolm Frank, Paul Roehrig and Ben Pring, published by John Wiley & Sons.
3. Internet of Things: A Hands-On Approach by Vijay Madisetti, Arshdeep Bahga, VPT; 1st edition 2014.

4. Jan Holler, 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
5. Meta Products -Building the Internet of Things by Wimer Hazenberg, Menno Huisman, BIS Publishers 2014.

List of Electives - Elective VI

22254E34A ADVANCED MATERIAL TECHNOLOGY 3 0 0 3

AIM:

To impart knowledge on advance concepts of material technology

OBJECTIVE:

- To enlight the PG students on elastic, plastic and fractured behaviour of engineering Materials.
- To train the PG students in selection of metallic and non-metallic materials for the various engineering applications.

UNIT I ELASTIC AND PLASTIC BEHAVIOR 10

Elasticity in metals and polymers Anelastic and visco-elastic behaviour – Mechanism of plastic deformation and non metallic shear strength of perfect and real crystals – Strengthening mechanisms, work hardening, solid solutioning, grain boundary strengthening, poly phase mixture, precipitation, particle, fibre and dispersion strengthening. Effect of temperature, strain and strain rate on plastic behaviour – Super plasticity – Deformation of non crystalline materials.

UNIT II FRACTURE BEHAVIOUR 10

Griffith’s theory, stress intensity factor and fracture toughness – Toughening mechanisms – Ductile, brittle transition in steel – High temperature fracture, creep – Larson Miller parameter – Deformation and fracture mechanism maps – Fatigue, low and high cycle fatigue test, crack initiation and propagation mechanisms and Paris law. Effect of surface and metallurgical parameters on fatigue – Fracture of non metallic materials – Failure analysis, sources of failure, procedure of failure analysis.

UNIT III SELECTION OF MATERIALS 10

Motivation for selection, cost basis and service requirements – Selection for mechanical properties, strength, toughness, fatigue and creep – Selection for surface durability corrosion and wear resistance – Relationship between materials selection and processing – Case studies in materials selection with relevance to aero, auto, marine, machinery and nuclear applications – Computer aided materials selection.

UNIT IV MODERN METALLIC MATERIALS 8

Dual phase steels, High strength low alloy (HSLA) steel, Transformation induced plasticity (TRIP) Steel, Maraging steel, Nitrogen steel – Intermetallics, Ni and Ti aluminides – smart materials, shape memory alloys – Metallic glass and nano crystalline materials.

UNIT V NON METALLIC MATERIALS 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.

22254E34B INDUSTRIAL SAFETY 3 0 0 3

OBJECTIVE:

To develop and strengthen the safety ideas and motivate the students to impart basic safety skills and understandings to run an industry efficiently and effectively

UNIT I OPERATIONAL SAFETY 9

Hot metal operation, boiler, pressure vessels – heat treatment shop – gas furnace operation – electroplating – hot bending pipes – safety in welding and cutting, Cold – metal operation – safety in machine shop – cold bending and chamfering of pipesmetal cutting – shot blasting, grinding, painting – power press and other machines. Management of toxic gases and chemicals – industrial fires and prevention – road safety – highway and urban safety – safety of sewage disposal and cleaning – control of environmental pollution – managing emergencies in industries – planning security and risk assessments, on – site and off site. Control of major industrial hazards.

UNIT II SAFETY APPRAISA L AND ANALYSIS 9

Human side of safety – personal protective equipment – causes and cost of accidents. Accidents prevention program – specific hazard control strategies – HAZOP training and development of employees – first aid – fire fight devices – accident reporting, investigation. Measurement of safety performance, accident reporting and investigation – plant safety inspection, job safety analysis – safety permit procedures. Product safety – plant safety rules and procedures – safety sampling – safety inventory systems. Determining the cost effectiveness of safety measurement.

UNIT **III OCCUPATIONAL HEALTH 9**

Concept and spectrum of health functional units and activities of operational health service – occupational and related disease – levels of prevention of diseases – notifiable occupational diseases Toxicology Lead – Nickel, chromium and manganese toxicity – gas poisoning (such as CO, Ammonia Chlorise, So2, H2s.) their effects and prevention – effects of ultra violet radiation and infrared radiation on human system.

UNIT IV SAFETY AND HEALTH REGULATIONS 9

Safety and health standards – industrial hygiene – occupational diseases prevention welfare facilities. The object of factories act 1948 with special reference to safety provisions, model rules 123a, history of legislations related to safety – pressure vessel act – Indian boiler act – the environmental protection act – electricity act – explosive act.

UNIT V SAFETY MANAGEMENT 9

Evaluation of modern safety concepts – safety management functions – safety organization, safety department- safety committee, safety audit – performance measurements and motivation – employee participation in safety - safety and productivity.

TOTAL: 45 PERIODS

OUTCOME:

At the end of this course the students are expected to gain knowledge and skills needed to run an industry with utmost safety precautions.

REFERENCES:

1. John V Grimaldi, Safety Management. AITB publishers, 2003.

2. John.V .Grimaldi and Rollin. H Simonds, “Safety Managenent”, All India traveler book seller, New Delhi – 1989.

3. Krishnan N.V, “Safety in Industry”, Jaico Publisher House, 1996.

4. Singh, U.K and Dewan, J.M., “Sagety, Security And Risk Management”, APH publishing company, New Delhi, 1996.

22254E34C ADDITIVE MANUFACTURING

OBJECTIVE:

 To educate students with fundamental and advanced knowledge in the field of Additive manufacturing technology and the associated Aerospace, Architecture, Art, Medical and industrial applications.

UNIT I INTRODUCTION: 8

Need - Development of AM systems – AM process chain - Impact of AM on Product Development - Virtual Prototyping- Rapid Tooling – RP to AM -Classification of AM processes-Benefits- Applications.

UNIT II REVERSE ENGINEERING AND CAD MODELING: 10

Basic concept- Digitization techniques – Model reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data requirements – Geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing, Tool path generation-Software for AM- Case studies.

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS 10

Stereolithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications.
Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications. Laminated Object Manufacturing (LOM): Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS: 10

Selective Laser Sintering (SLS): Principle, process, Indirect and direct SLS- powder structures, materials, post processing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping (LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

UNIT V OTHER ADDITIVE MANUFACTURING SYSTEMS: 7

Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballastic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of this course the students are expected to learn about a variety of Additive Manufacturing (AM) technologies, their potential to support design and manufacturing, case studies relevant to mass customized manufacturing, and some of the important research challenges associated with AM and its data processing tools

REFERENCES:

1. Chua, C.K., Leong K.F. and Lim C.S., "Rapid prototyping: Principles and applications", second edition, World Scientific Publishers, 2010.
2. Gebhardt, A., "Rapid prototyping", Hanser Gardener Publications, 2003.
3. Gibson, I., Rosen, D.W. and Stucker, B., "Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
4. Hilton, P.D. and Jacobs, P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2005.
5. Kamrani, A.K. and Nasr, E.A., "Rapid Prototyping: Theory and practice", Springer, 2006.
6. Liou, L.W. and Liou, F.W., "Rapid Prototyping and Engineering applications : A tool box for prototype development", CRC Press, 2011.

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	6
III	Project Work Phase I	10
IV	Project Work	15

Blueprint for assessment of student's performance in Research Led Seminar Course

- **Internal Assessment: 40 Marks**
  - Seminar Report (UG)/Concept Note(PG) : 5 X 4= 20 Marks
  - Seminar Review Presentation : 10 Marks
  - Literature Survey : 10 Marks
- **Semester Examination : 60 Marks**

(Essay type Questions set by the concerned resource persons)

Blueprint for assessment of student's performance in Design/Socio Technical Project

- **Continuous Internal Assessment through Reviews: 40 Marks**
  - Review I : 10 Marks
  - Review II : 10 Marks
  - Review III : 20 Marks
- **Evaluation of Socio Technical Practicum Final Report: 40 Marks**
- **Viva- Voce Examination: 20 Marks**
- **Total: 100 Marks**

Blueprint for assessment of student's performance in Research Methodology Courses

Continuous Internal Assessment: 20 Marks

- Research Tools(Lab) : 10 Marks
- Tutorial: 10 Marks

Model Paper Writing:	**40 Marks**
• Abstract:	5 Marks
• Introduction:	10 Marks
• Discussion:	10 Marks
• Review of Literature:	5 Marks
• Presentation:	10 Marks
Semester Examination:	**40 Marks**
Total:	**100 Marks**

PRIST Deemed to be University

VALLAM, THANJAVUR.

DEPARTMENT OF
MECHANICAL ENGINEERING

PROGRAMME HANDBOOK

M.Tech. – Manufacturing Technology

PART TIME PROGRAMME

Regulation 2022

(for candidates admitted to M.Tech Mechanical Engineering programme from June 2022onwards)

COURSE STRUCTURE

SEMESTER-I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22248S11EP	Advanced Engineering Mathematics	3	1	-	4
22254C12P	Theory of Metal Cutting	3	1	-	4
22254C13P	Advanced Manufacturing Processes	3	1	-	4
22254L14P	CAD/CAM Laboratory	-	-	3	3
TOTAL NO. OF CREDITS					**15**

SEMESTER-II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254C21P	Tooling for Manufacturing	3	1	-	4
22254C22P	MEMS and Nano Technology	4	-	-	4
22254E23_P	Elective - I	4	-	-	3
22254L24P	Automation Lab	-	-	3	3
222TECWRP	Technical Writing/Seminar	-	-	3	3
TOTAL NO. OF CREDITS					**17**

SEMESTER-III

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254C31P	Advances in Casting and Welding	3	1	-	4
22254C32P	Automated Computer Integrated Manufacturing Systems	3	1	-	4
22254E33P	Elective II	4	-	-	3
TOTAL NO. OF CREDITS					**11**

SEMESTER-IV

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
22254C41P	Manufacturing Metrology and Quality Control	4	-	-	4
22254C42P	Metal Forming Process	4	-	-	4
22254E43_p	Elective III	4	-	-	3
22254P44P	Project Work Phase - I	-	-	10	10
TOTAL NO. OF CREDITS					**21**

SEMESTER-V

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
22254E51_P	Elective IV	4	-	-	3
22254E52_P	Elective V	4	-	-	3
22254E53_P	Elective VI	4	-	-	3
TOTAL NO. OF CREDITS					**9**

SEMESTER-VI

Course Code	Title of Paper	Hours / Per Week			
		L	**T**	**P**	**C**
22254P61P	Project Work Phase - II	-	-	15	15
TOTAL NO. OF CREDITS					**15**

ELECTIVE-I

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E23AP	Finite Element Application in Manufacturing	4	-	-	3
22254E23BP	Lean Manufacturing	4	-	-	3
22254E23CP	Design and Analysis of Experiments	4	-	-	3

ELECTIVE-II

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E33AP	Materials Management And Logistics	4	-	-	3
22254E33BP	Quality And Reliability Engineering	4	-	-	3
22254E33CP	Manufacturing Information Systems	4	-	-	3

ELECTIVE-III

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E43AP	Non-Destructive Testing And Evaluation	4	-	-	3
22254E43BP	Maintenance Management	4	-	-	3
22254E43CP	Optimization Techniques	3	1	-	3

ELECTIVE-IV

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E51AP	Process Planning And Cost Estimation	4	-	-	3
22254E51BP	Instrumentation and Control Engineering	4	-	-	3
22254E51CP	Research Methodology	3	-	-	3

ELECTIVE-V

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E52AP	Product Design and Development	4	-	-	3
22254E52BP	Fluid Power Automation	4	-	-	3
22254E52CP	Internet Of Things For Manufacturing	4	-	-	4

ELECTIVE-VI

Course Code	Title of Paper	Hours / Per Week			
		L	T	P	C
22254E53AP	Advanced Material Technology	4	-	-	3
22254E53BP	Industrial Safety	4	-	-	3
22254E53CP	Additive Manufacturing	4	-	-	4

Total No of Credits - 88

DEPARTMENT OF MECHANICAL ENGINEERING

M.TECH., MANUFACTURING TECHNOLOGY - PART TIME PROGRAMME SYLLABUS-REGULATIONS- 2022

I - SEMESTER

22248S11EP ADVANCED ENGINEERING MATHEMATICS 3 1 0 4

LAPLACE TRANSFORM:

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

FOURIER TRANSFORM

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

PROBABILITY OF DISTRIBUTION

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

TESTING OF HYPOTHESIS

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

THEORY OF ESTIMATION

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

BOOKS FOR REFERENCE:

1. Sankar Rao.K., Introduction to partial differential equations, Pnentile Hall of India, New Delhi – 1995.
2. Sneddon.I.N., Elements of partial differential equations, MC Graw Hill, 1996
3. Engineering Statistics, Bowher and LIberman
4. Gupta.S.C. & Kappor, V.K. Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 1999

22254C12P 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

22254C13P

ADVANCED MANUFACTURING PROCESSES
4 0 0 4

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 REFERENCE:

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., 1980
7. More Madon, Fundamentals of Microfabrication, CRC Press, 1997.

22254L19 CAD / CAM LABORATORY 0 0 3 3

OBJECTIVES:

 To teach the students about the drafting of 3D components and analyzing the same using various CAD packages and programming of CNC machines

 To train them to use the various sensors

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. Study of Sensors, Transducers & PLC: Hall-effect sensor, Pressure sensors, Strain gauge, PLC, LVDT, Load cell, Angular potentiometer, Torque, Temperature & Optical Transducers.

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: 60 PERIODS

OUTCOMES :

At the end of this course the students are expected

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

LIST OF EQUIPMENTS S.NO	EQUIPMENT	QUANTITY
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

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.

22254C21 TOOLING FOR MANUFACTURING 4 0 0 4

OBJECTIVES:

 To study the various design considerations for tooling.

 Develop knowledge in tooling and work holding devices

UNIT I INTRODUCTION 12

Manufacturing Processes-objectives of manufacturing processes-classification of manufacturing process-Objectives of Tool design-tool design process-Nature and scope of Tool engineering-principles of economy for tooling-problems of economy in tooling-planning and tooling for economy-Manufacturing principles applicable to process and tool planning-tool control-tool maintenance-tool materials and its selection

UNIT II TOOLING FOR METAL REMOVAL PROCESSES 12

Traditional machining processes -work and tool holding devices-tool nomenclatures-Mechanism of machining-force temperature and tool life of single point tool-multipoint tools -tool design-tool wear-special processes-capstan and turret lathe-tooling layout of automats-tooling in NC and CNC machines-tooling for machining centres-CAD in tool design-Jigs and fixtures-design-Non-traditional material removal processes-mechanical, electrical thermal and chemical energy processes-principles-operation-equipment-tooling parameters and limitations

UNIT III TOOLING FOR METAL FORMING PROCESSES 12

Classification of Forming processes-Types of presses-design of -blanking and piercing dies-simple, compound, combination and progressive dies-Drawing dies-Bending dies-forging dies-plastic moulding dies

UNIT IV TOOLING FOR METAL CASTING AND METAL JOINING PROCESSES 12

Tools and Equipment for moulding-patterns –pattern allowances – pattern construction-die casting tools-mechanization of foundries. Tooling for Physical joining processes Design of welding fixtures – Arc welding, Gas welding, Resistance welding, laser welding fixtures-Tooling for Soldering and Brazing Tooling for Mechanical joining processes

UNIT V TOOLING FOR INSPECTION AND GAUGING 12

Survey of linear and angular measurements-standards of measurement-design and manufacturing of gauges- measurement of form-Inspection bench centre-co-ordinate measuring machine-tooling in CMM.

TOTAL: 60 PERIODS

OUTCOMES:

At the end of this course the students are well versed in

1. State of Art in Tooling in Manufacturing and Inspection
2. Design and Develop tooling for Flexible Manufacturing

REFERENCES:

1. Cyril Donaldson Tool Design, Tata McGraw Hill, 1976
2. Hoffman E.G Fundamentals of tool design SME 1984.
3. Kalpak Jian S., Manufacturing Engineering and Technology Addison Wesley 1995.
4. L E Doyle Tool Engineering Prentice Hall 1950
5. Wellar, J Non-Traditional Machining Processes, SME, 1984

22254C22P 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 REFERENCE:

1. Tai – Ran Hsu, MEMS and Microsystems Design and Manufacture, Tata-McGraw Hill, New Delhi, 2002.

2. Mark Madou Fundamentals of Microfabrication, CRC Press, New York, 1997.

3. Norio Taniguchi, Nano Technology, Oxford University Press, New York, 2003

4. The MEMS Hand book, Mohamed Gad-el-Hak, CRC Press, New York, London.

5. Charles P Poole, Frank J Owens, Introduction to Nano technology, John Wiley and Sons, 2003

6. Julian W. Hardner Micro Sensors, Principles and Applications, CRC Press 1993.

22254L24P
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

222TECWRP 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.

22254C31P ADVANCES IN CASTING AND WELDING L T P C

3 0 0 3

OBJECTIVES:

 To study the metallurgical concepts and applications of casting and welding process.

 To acquire knowledge in CAD of casting and automation of welding process.

UNIT I CASTING DESIGN 8

Heat transfer between metal and mould –– Design considerations in casting – Designing for directional solidification and minimum stresses - principles and design of gating and risering

UNIT II CASTING METALLURGY 8

Solidification of pure metal and alloys – shrinkage in cast metals – progressive and directional solidification –– Degasification of the melt-casting defects – Castability of steel , Cast Iron, Al alloys, Babbit alloy and Cu alloy.

UNIT III RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT 8

Shell moulding, precision investment casting, CO2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry – sand reclamation – material handling in foundry pollution control in foundry –– Computer aided design of casting.

UNIT IV WELDING METALLURGY AND DESIGN 10

Heat affected Zone and its characteristics – W eldability of steels, cast iron, stainless steel, aluminum, Mg , Cu , Zirconium and titanium alloys – Carbon Equivalent of Plain and alloy steels Hydrogen embrittlement – Lamellar tearing – Residual stress – Distortion and its control . Heat transfer and solidification - Analysis of stresses in welded structures – pre and post welding heat treatments – weld joint design – welding defects – Testing of weldment.

UNIT V RECENT TRENDS IN WELDING 11

Friction welding, friction stir welding – explosive welding – diffusion bonding – high frequency induction welding – ultrasonic welding – electron beam welding – Laser beam welding –Plasma welding – Electroslag welding- narrow gap, hybrid twin wire active TIG – Tandem MIG- modern brazing and soldering techniques – induction, dip resistance, diffusion processes – Hot gas, wave and vapour phase soldering. Overview of automation of welding in aerospace, nuclear, surface transport vehicles and under water
welding.

OUTCOMES:

At the end of this course the students are expected to impart knowledge on basic concepts and advances in casting and welding processes.

TOTAL: 45 PERIODS

REFERENCES:

1. ASM Handbook vol.6, welding Brazing & Soldering, 2003
2. ASM Handbook, Vol 15, Casting, 2004
3. Carrry B., Modern Welding Technology, Prentice Hall Pvt Ltd., 2002
4. CORNU.J. Advanced welding systems – Volumes I, II and III, JAICO Publishers, 1994.
5. HEINELOPER & ROSENTHAL, Principles of Metal Casting, Tata McGraw Hill, 2000.
6. IOTROWSKI – Robotic welding – A guide to selection and application – Society of mechanical Engineers, 1987.
7. Jain P.L., Principles of Foundry Technology, Tata McGraw Hill Publishers, 2003
8. LANCASTER.J.F. – Metallurgy of welding – George Alien & Unwin Publishers, 1980
9. Parmer R.S., Welding Engineering and Technology, Khanna Publishers,2002

10. SCHWARIZ, M.M. – Source book on innovative welding processes – American Society for Metals (OHIO), 1981

22254C32P AUTOMATED COMPUTER INTEGRATED MANUFACTURING SYSTEMS 4 0 0 4

OBJECTIVE:

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

UNIT I INTRODUCTION 6

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

UNIT II AUTOMATED MANUFACTURING SYSTEMS 10

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

UNIT III GROUP TECHNOLOGY AND FMS 10

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

UNIT IV PROCESS PLANNING 10

Process planning – Activities in process planning, Information's required. From design to process planning – classification of manufacturing processes – Selection of primary manufacturing processes – selecting among casting process, forming process and machining process. Sequencing of operations according to Anteriorities – various examples – forming of Matrix of Anteriorities – case study. Typical process sheet – case studies in Manual process planning. Computer Aided Process Planning – Process planning module and data base – Variant process planning – Two stages in VPP – Generative process planning – Flow chart showing various activities in generative PP – Semi generative process planning.

UNIT V TYPES OF PROCESS CONTROL AND AUTOMATIC DATA CAPTURE 9

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

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Mikell P.Groover, “Automation, Production system and Computer integrated Manufacturing”, Prentice Hall of India Pvt. Ltd., 2008.
2. Radhakrishnan,P., Subramanian,S., and Raju,V., “CAD/CAM/CIM” New Age International Publishers, 2000.
3. James A.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.

22254C41P 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.

22254C42P 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

List of Electives - Elective I

22254E23AP - FINITE ELEMENT APPLICATIONS IN MANUFACTURING 3 10 4

AIM:

To impart knowledge in the area of finite element methods and its application in manufacturing.

OBJECTIVE:

To study the fundamentals of one dimensional and two dimensional problems using FEA in manufacturing.

UNIT I INTRODUCTION 6

Fundamentals – Initial, boundary and eigen value problems – weighted residual, Galerkin and Raleigh Ritz methods - Integration by parts – Basics of variational formulation – Polynomial and Nodal approximation.

UNIT II ONE DIMENSIONAL ANALYSIS 10

Steps in FEM – Discretization. Interpolation, derivation of elements characteristic matrix, shape function, assembly and imposition of boundary conditions-solution and post processing – One dimensional analysis in solid mechanics and heat transfer.

UNIT III SHAPE FUNCTIONS AND HIGHER ORDER FORMULATIONS 10

Shape functions for one and two dimensional elements- Three noded triangular and four nodded quadrilateral element Global and natural co-ordinates—Non linear analysis – Isoparametric elements – Jacobian matrices and transformations – Basics of two dimensional, plane stress, plane strain and axisymmetric analysis.

UNIT IV COMPUTER IMPLEMENTATION 9

Pre Processing, mesh generation, elements connecting, boundary conditions, input of material and processing characteristics – Solution and post processing – Overview of application packages – Development of code for one dimensional analysis and validation.

UNIT V ANALYSIS OF PRODUCTION PROCESSES 10

FE analysis of metal casting – special considerations, latent heat incorporation, gap element – Time stepping procedures – Crank – Nicholson algorithm – Prediction of grain structure – Basic concepts of plasticity and fracture – Solid and flow formulation – small incremental deformation formulation – Fracture criteria – FE analysis of metal cutting, chip separation criteria, incorporation of strain rate dependency – FE analysis of welding.

TOTAL: 45 PERIODS

BOOKS FOR REFERENCE:

1. Reddy, J.N. An Introduction to the Finite Element Method, McGraw Hill,1985.
2. Rao, S.S., Finite Element method in engineering, Pergammon press, 1989.
3. Lewis R.W.Morgan, K, Thomas, H.R. and Seetharaman, K.N. The Finite Element

Method in Heat Transfer Analysis, John Wiley, 1994.

22254E23BP 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.

22254E16A MATERIALS MANAGEMENT AND LOGISTICS 3 0 0 3

AIM:

To introduce to the students the various functions of materials management and logistics

OBJECTIVE:

To make the students familiar with the various concepts and functions of material management, so that the students will be in a position to manage the materials management department independently.

UNIT I INTRODUCTION
6

Introduction to materials management – Objectives – Functions – Operating Cycle – Value analysis – Make or buy decisions.

UNIT II MANAGEMENT OF PURCHASE
7

Purchasing policies and procedures – Selection of sources of supply – Vendor development – Vendor evaluation and rating – Methods of purchasing – Imports – Buyer – Seller relationship – Negotiations.

UNIT III MANAGEMENT OF STORES AND LOGISTICS
12

Stores function – Location – Layout – Stock taking – Materials handling – Transportation – Insurance – Codification – Inventory pricing – stores management – safety – warehousing – Distribution linear programming – Traveling Salesman problems – Network analysis – Logistics Management.

UNIT IV MATERIALS PLANNING
10

Forecasting – Materials requirements planning – Quantity – Periodic – Deterministic models – Finite production.

UNIT V INVENTORY MANAGEMENT
10

ABC analysis – Aggregate planning – Lot size under constraints – Just in Time (JIT) system.

TOTAL: 45 periods

BOOKS FOR REFERENCES:

1. Lamer Lee and Donald W.Dobler, Purchasing and Material Management, Text and cases, Tata McGraw Hill, 1996.
2. Gopalakrishnan.P, Handbook of Materials Management, Prentice Hall of India, 1996.
3. 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.

List of Electives - Elective II

22254E33BP **QUALITY AND RELIABILITY ENGINEERING** **3 0 0 3**

OBJECTIVES:

To make the students to understand the various quality control techniques and to construct the various quality control charts for variables and attributes and also the design concepts for reliable system and maintenance aspects in industries.

UNIT I QUALITY & STATISTICAL PROCESS CONTROL 8

Quality – Definition – Quality Assurance – Variation in process – Factors – process capability – control charts – variables X, R and X, - Attributes P, C and U-Chart tolerance design. Establishing and interpreting control charts – charts for variables – Quality rating – Short run SPC.

UNIT II ACCEPTANCE SAMPLING 8

Lot by lot sampling – types – probability of acceptance in single, double, multiple sampling plans – OC curves – Producer's risk and consumer's risk. AQL, LTPD, AOQL, Concepts – standard sampling plans for AQL and LTPD – use of standard sampling plans.

UNIT III EXPERIMENTAL DESIGN AND TAGUCHI METHOD 9

Fundamentals – factorial experiments – random design, Latin square design – Taguchi method – Loss function – experiments – S/N ratio and performance measure – Orthogonal array.

UNIT IV CONCEPT OF RELIABILITY 9

Definition – reliability vs quality, reliability function – MTBF, MTTR, availability, bathtub curve – time dependent failure models – distributions – normal, weibull, lognormal – Reliability of system and models – serial, parallel and combined configuration – Markove analysis, load sharing systems, standby systems, covarient models, static models, dynamic models.

UNIT V DESIGN FOR RELIABILITY AND MAINTAINABILITY 11

Reliability design process, system effectiveness, economic analysis and life cycle cost, reliability allocation, design methods, parts and material selection, derating, stress-strength and analysis, failure analysis, identification determination of causes, assessments of effects, computation of criticality index, corrective action, system safety – analysis of down-time – the repair time distribution, stochastic point processes system repair time, reliability under preventive maintenance state dependent system with repair. MTTR – mean system down time, repair vs replacement, replacement models, proactive, preventive, predictive maintenance maintainability and availability, optimization techniques for system reliability with redundancy heuristic methods applied to optimal system reliability.

TOTAL: 45 PERIODS

Text Books:

1. Statistical Process Control, by Eugene Grant, Richard Leavenworth, McGraw Hill.
2. Quality Engineering in Production Systems, by G Taguchi , McGraw Hill, 1989.
3. Optimization &Variation Reduction in Quality, byW.A. Taylor,Tata McGraw Hill, 1991.

Reference Books:

1. Jurans Quality Planning and Analysis, by Frank. M.Gryna Jr. McGrawHill
2. Taguchi Techniques for Quality Engineering, (2ndEdition) by Philipposs, McGraw Hill, 1996,.
3. Reliability Engineering, (3rdEdition), by LS Srinath, Affiliated East West Pvt Ltd, 1991.
4. Reliability Engineering, by E.Bala Guruswamy, Tata McGraw Hill, 1994

22254E32A 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.

22254E33B P 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.

22254E33CP

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

22254E43AP Non-Destructive Testing And Evaluation

OBJECTIVES :

To stress the importance of NDT in engineering.

UNIT I

NON-DESTRUCTIVE TESTING: AN INTRODUCTION, VISUAL INSPECTION & LIQUID PENETRANT TESTING 6

Introduction to various non-destructive methods, Comparison of Destructive and Non destructive Tests, Visual Inspection, Optical aids used for visual inspection, Applications.

Physical principles, procedure for penetrant testing, Penetrant testing materials, Penetrant testing methods-water washable, Post – Emulsification methods, Applications

UNIT II EDDY CURRENT TESTING & ACOUSTIC EMISSION 10

Principles, Instrumentation for ECT, Absolute, differential probes, Techniques – High sensitivity techniques, Multi frequency, Phased array ECT, Applications.

Principle of AET, Instrumentation, Applications - testing of metal pressure vessels, Fatigue crack detection in aerospace structures.

UNIT III MAGNETIC PARTICLE TESTING & THERMOGRAPHY 10

Principle of MPT, procedure used for testing a component, Equipment used for MPT, Magnetizing techniques, Applications.

Principle of Thermography, Infrared Radiometry, Active thermography measurements, Applications – Imaging entrapped water under an epoxy coating, Detection of carbon fiber contaminants.

UNIT IV ULTRASONIC TESTING 10

Principle, Ultrasonic transducers, Ultrasonic Flaw detection Equipment, Modes of display A- scan, B-Scan, C- Scan, Applications, Inspection Methods - Normal Incident Pulse-Echo Inspection, Normal Incident Through-transmission Testing, Angle Beam Pulse-Echo testing, TOFD Technique, Applications of Normal Beam Inspection in detecting fatigue cracks, Inclusions, Slag, Porosity and Intergranular cracks - Codes, standards, specification and procedures and case studies in ultrasonics test.

UNIT V RADIOGRAPHY 9

Principle of Radiography, x-ray and gamma ray sources- safety procedures and standards, Effect of radiation on Film, Radiographic imaging, Inspection Techniques – Single wall single image, Double wall

Penetration, Multiwall Penetration technique, Real Time Radiography - Codes, standards, specification and procedures and case studies in Radiography test.
Case studies on defects in cast, rolled, extruded, welded and heat treated components - Comparison and selection of various NDT techniques
TOTAL: 45 PERIODS
OUTCOMES:
At the end of this course the students are expected to have hands on experience on all types of NDT and their applications in Engineering.
REFERENCES:
1. Baldev Raj, Jeyakumar,T., Thavasimuthu,M., "Practical Non Destructive Testing" Narosa publishing house, New Delhi, 2002
2. Krautkramer. J., "Ultra Sonic Testing of Materials", 1st Edition, Springer – Verlag Publication, New York, 1996.
3. Peter J. Shull "Non Destructive Evaluation: Theory, Techniques and Application" Marcel Dekker, Inc., New York, 2002
4. www.ndt.net

22254E43BP 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.

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22254E43CP 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

22254E51AP PROCESS PLANNING AND COST ESTIMATION 3 0 0 3

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

UNIT I INTRODUCTION TO PROCESS PLANNING 10

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

UNIT II PROCESS PLANNING ACTIVITIES 10

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 8

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 8

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: At the end of this course the students are expected to use the concepts of process planning and cost estimation for various products.

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. Peter scalon, "Process planning, Design/Manufacture Interface", Elsevier science technology Books, Dec 2002.
4. Russell R.S and Tailor B.W, "Operations Management", 4th Edition, PHI, 2003.

22254E51BP 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 REFERENCE:

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

22254E51CP 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

22254E52AP INTERNET OF THINGS FOR MANUFACTURING 3 0 0 3

OBJECTIVES:

 To discover key IoT concepts including identification, sensors, localization, wireless protocols
 To explore IoT technologies, architectures, standards, and regulation
 To realize the value created by collecting, communicating, coordinating, and leveraging data
 To examine developments that will likely shape the industrial landscape in the future;

UNIT I INTRODUCTION 9

Technology of the IoT and applications,. IoT data management requirements, Architecture of IoT, Security issues Opportunities for IoT -Issues in implementing IoT. Technological challenges, RFID and the Electronic Product Code (EPC) network, the web of things.

UNIT II DESIGN OF IoT 9

Design challenges in IoT -Standardization, Security and privacy, Infrastructure, Analytics. Design steps for implementing IoT.

UNIT III PROTOTYPING OF IoT 9

Design principles for connected devices -Embedded devices, physical design, online components, embedded coding system. Informed Manufacturing plant – Elements, IoT implementation in Transportation and logistics, Energy and utilities, Automotive Connected supply chain, Plant floor control automation, remote monitoring, Management of critical assets, Energy management and resource optimization, proactive maintenance.

UNIT IV PREREQUISITES FOR IoT 9

IOT Technologies Wireless protocols low-power design (Bluetooth Low Energy), range extension techniques (data mining and mesh networking), and data-intensive IoT for continuous recognition applications Data storage and analysis Localization algorithms Localization for mobile systems

UNIT V APPLICATION IN MANUFACTURING 9

Applications HCI and IoT world -Multilingual interactions Robotics and Autonomous Vehicles Sensing and data processing-Simultaneous mapping and localization-Levels of autonomy, Smart factories, Future research challenges

TOTAL : 45 PERIODS

OUTCOMES:

- At the end of this course the students are expected to
- Utilizing sensors to gain greater visibility and real-time situational awareness
- Vertical applications that provide a clear business case and a pressing opportunity
- Emerging technologies to address IoT challenges

REFERENCES:

1. Adrian McEwan and Hakim Cassimally, "Designing the internet of things", Wiley, 2013
2. Code Halos: How the Digital Lives of People, Things, and Organizations are Changing the Rules of Business, by Malcolm Frank, Paul Roehrig and Ben Pring, published by John Wiley & Sons.
3. Internet of Things: A Hands-On Approach by Vijay Madisetti, Arshdeep Bahga, VPT; 1st edition 2014.
4. Jan Holler, 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
5. Meta Products -Building the Internet of Things by Wimer Hazenberg, Menno Huisman, BIS Publishers 2014.

22254E52BP 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

22254E53AP 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 REFERENCE:

1. George E.Dieter, Mechanical Metallurgy, McGraw Hill, 1988.
2. Thomas H. Courtney, Mechanical Behaviour of Materials, (2nd edition), McGraw Hill, 2000.
3. Flinn, R.A., and Trojan, P.K., Engineering Materials and their Applications, (4^{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.

22254E53BP INDUSTRIAL SAFETY 3 0 0 3

OBJECTIVE:

To develop and strengthen the safety ideas and motivate the students to impart basic safety skills and understandings to run an industry efficiently and effectively

UNIT I OPERATIONAL SAFETY 9

Hot metal operation, boiler, pressure vessels – heat treatment shop – gas furnace operation – electroplating – hot bending pipes – safety in welding and cutting, Cold – metal operation – safety in machine shop – cold bending and chamfering of pipesmetal cutting – shot blasting, grinding, painting – power press and other machines. Management of toxic gases and chemicals – industrial fires and prevention – road safety – highway and urban safety – safety of sewage disposal and cleaning – control of environmental pollution – managing emergencies in industries – planning security and risk assessments, on – site and off site. Control of major industrial hazards.

UNIT II SAFETY APPRAISA L AND ANALYSIS 9

Human side of safety – personal protective equipment – causes and cost of accidents. Accidents prevention program – specific hazard control strategies – HAZOP training and development of employees – first aid – fire fight devices – accident reporting, investigation. Measurement of safety performance, accident reporting and investigation – plant safety inspection, job safety analysis – safety permit procedures. Product safety – plant safety rules and procedures – safety sampling – safety inventory systems. Determining the cost effectiveness of safety measurement.

UNIT III OCCUPATIONAL HEALTH 9

Concept and spectrum of health functional units and activities of operational health service – occupational and related disease – levels of prevention of diseases – notifiable occupational diseases Toxicology Lead – Nickel, chromium and manganese toxicity – gas poisoning (such as CO, Ammonia Chlorise, So2, H2s.) their effects and prevention – effects of ultra violet radiation and infrared radiation on human system.

UNIT IV SAFETY AND HEALTH REGULATIONS 9

Safety and health standards – industrial hygiene – occupational diseases prevention welfare facilities. The object of factories act 1948 with special reference to safety provisions, model rules 123a, history of legislations related to safety – pressure vessel act – Indian boiler act – the environmental protection act – electricity act – explosive act.

UNIT V SAFETY MANAGEMENT 9

Evaluation of modern safety concepts – safety management functions – safety organization, safety department- safety committee, safety audit – performance measurements and motivation – employee participation in safety - safety and productivity.

TOTAL: 45 PERIODS

OUTCOME:

At the end of this course the students are expected to gain knowledge and skills needed to run an industry with utmost safety precautions.

REFERENCES:

1. John V Grimaldi, Safety Management. AITB publishers, 2003.

2. John.V .Grimaldi and Rollin. H Simonds, “Safety Managenent”, All India traveler book seller, New Delhi – 1989.

3. Krishnan N.V, “Safety in Industry”, Jaico Publisher House, 1996.

4. Singh, U.K and Dewan, J.M., “Sagety, Security And Risk Management”, APH publishing company, New Delhi, 1996.

22254E53CP ADDITIVE MANUFACTURING 3 0 0 3

OBJECTIVE:

 To educate students with fundamental and advanced knowledge in the field of Additive manufacturing technology and the associated Aerospace, Architecture, Art, Medical and industrial applications.

UNIT I INTRODUCTION: 8

Need - Development of AM systems – AM process chain - Impact of AM on Product Development - Virtual Prototyping- Rapid Tooling – RP to AM -Classification of AM processes-Benefits- Applications.

UNIT II REVERSE ENGINEERING AND CAD MODELING: 10

Basic concept- Digitization techniques – Model reconstruction – Data Processing for Rapid Prototyping: CAD model preparation, Data requirements – Geometric modeling techniques: Wire frame, surface and solid modeling – data formats - Data interfacing, Part orientation and support generation, Support structure design, Model Slicing, Tool path generation-Software for AM- Case studies.

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS 10

Stereolithography Apparatus (SLA): Principle, pre-build process, part-building and post-build processes, photo polymerization of SL resins, part quality and process planning, recoating issues, materials, advantages, limitations and applications.

Solid Ground Curing (SGC): working principle, process, strengths, weaknesses and applications. Fused deposition Modeling (FDM): Principle, details of processes, process variables, types, products, materials and applications. Laminated Object Manufacturing (LOM): Working Principles, details of processes, products, materials, advantages, limitations and applications - Case studies.

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS: 10

Selective Laser Sintering (SLS): Principle, process, Indirect and direct SLS- powder structures, materials, post processing, surface deviation and accuracy, Applications. Laser Engineered Net Shaping (LENS): Processes, materials, products, advantages, limitations and applications– Case Studies.

UNIT V OTHER ADDITIVE MANUFACTURING SYSTEMS: 7

Three dimensional Printing (3DP): Principle, basic process, Physics of 3DP, types of printing, process capabilities, material system. Solid based, Liquid based and powder based 3DP systems, strength and weakness, Applications and case studies. Shape Deposition Manufacturing (SDM), Ballastic Particle Manufacturing (BPM), Selective Laser Melting, Electron Beam Melting.

TOTAL: 45 PERIODS

OUTCOMES:
On completion of this course the students are expected to learn about a variety of Additive Manufacturing (AM) technologies, their potential to support design and manufacturing, case studies relevant to mass customized manufacturing, and some of the important research challenges associated with AM and its data processing tools

REFERENCES:
1. Chua, C.K., Leong K.F. and Lim C.S., “Rapid prototyping: Principles and applications”, second edition, World Scientific Publishers, 2010.
2. Gebhardt, A., “Rapid prototyping”, Hanser Gardener Publications, 2003.
3. Gibson, I., Rosen, D.W. and Stucker, B., “Additive Manufacturing Methodologies: Rapid Prototyping to Direct Digital Manufacturing”, Springer, 2010.
4. Hilton, P.D. and Jacobs, P.F., Rapid Tooling: Technologies and Industrial Applications, CRC press, 2005.
5. Kamrani, A.K. and Nasr, E.A., “Rapid Prototyping: Theory and practice”, Springer, 2006.
6. Liou, L.W. and Liou, F.W., “Rapid Prototyping and Engineering applications : A tool box for prototype development”, CRC Press, 2011.

PRIST Deemed to be University
Vallam, Thanjavur.

DEPARTMENT OF
MECHANICAL ENGINEERING

PROGRAM HANDBOOK

B.Tech
MECHANICAL ENGINEERING
Part time
[Regulation 2022]

Semester – I

Sl. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S11P	Transforms & Partial Differential Equations	3	1	0	4
2	22154C12P	Electrical drives and controls	3	0	0	3
3	22154C13P	Engineering Thermodynamics	3	1	0	4
4	22154C14P	Fluid Mechanics and Machinery	3	1	0	4
5	22154C15P	Manufacturing Technology - I	4	0	0	4
					Total No of Credits	19

Semester – II

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S21P	Numerical Methods	3	1	0	4
2	22154C22P	Manufacturing Technology - II	3	0	0	3
3	22154C23P	Thermal Engineering	3	1	0	4
4	22154C24P	Strength of Materials	3	1	0	4
5	22154C25P	Engineering Materials and Metallurgy	4	0	0	4
					Total No of Credits	19

Semester – III

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22148S31CP	Probability and Statistics	3	1	0	4
2	22154C32P	Kinematics of Machinery	3	1	0	4
3	22154C33P	Computer Aided Design and Manufacturing	4	0	0	4
4	22154C34P	Engineering Metrology and Measurements	4	0	0	4
5	22154L35P	Computer Aided Simulation and Analysis Laboratory	0	0	3	2
					Total No of Credits	18

Semester –IV

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22154C41P	Professional Ethics	4	0	0	4
2	22154C42P	Dynamics of Machinery	3	1	0	4
3	22154C43P	Design of Machine Elements	3	1	0	4
4	22154E44-P	Elective -I	4	0	0	4
5	22154L45P	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	22154C51P	Heat and Mass Transfer	3	1	0	4
2	22154C52P	Design of Transmission Systems	3	1	0	4
3	22154C53P	Safety in Process Industries	4	0	0	4
4	22154E54-P	Elective-II	4	0	0	4
5	22154L55P	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	22154C61P	Finite Elements Analysis	3	1	0	4
2	22154C62P	Mechatronics	4	0	0	4
3	22154C63P	Maintenance Engineering	4	0	0	4
4	22154E64-P	Elective-III	4	0	0	4
5	22154L65P	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	22160S71P	Total Quality Management	3	0	0	3
2	22154C72P	Process Planning and Cost Estimation	3	1	0	4
3	22154C73P	Advanced I.C. Engines	3	0	0	4
4	22154E74-P	Elective-IV	3	0	0	3
5	22154P75P	Project Work	0	0	12	6
					Total No of Credits	19

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	22154E44AP	Gas Dynamics and Jet Propulsion	4	0	0	4
2	22154E44BP	Welding Technology	4	0	0	4
3	22154E44CP	Fundamentals of Nanoscience	4	0	0	4
4	22154E44DP	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	22154E54AP	Environmental Science and Engineering	4	0	0	4
2	22154E54BP	Human Rights	3	0	0	4
3	22154E54CP	Robotics	4	0	0	4
4	22154E54DP	Marketing Management	4	0	0	4

Elective III
Semester – VI

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22154E64AP	Principles of Management	4	0	0	4
2	22154E64BP	Energy Conservation and Management	4	0	0	4
3	22154E64CP	Engineering Economics	4	0	0	4
4	22148E64DP	Mathematics for Industrial Operations	4	0	0	4

Elective IV
Semester – VII

S. No	Subject Code	Subject Name	Periods Per Week			C
			L	T	P	
1	22154E74AP	Additive Manufacturing	3	0	0	3
2	22154E74BP	Computational Fluid Dynamics	3	0	0	3
3	22154E74CP	Unconventional Machining Process	3	0	0	3
4	22154E74DP	Disaster Management	3	0	0	3

22148S11P 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.

22153C12P ELECTRICAL DRIVES AND CONTROLS

UNIT-I D.C. MACHINES (9)

Principle of operation, Construction, Method of Excitation, Characteristics of d.c shunt, series ,compound generator, emf equation, application. Characteristics of d.c shunt, series, compound motor, torque equation, application, Types of d.c motor starters.

UNIT-II A.C. MACHINES (9)

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

UNIT-III (9)

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

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

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

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

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

Total Hours : 45

TEXT BOOKS

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

REFERENCES

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

22154C13P 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.

22154C14P 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”, (5th edition), Laxmi publications (P) Ltd, New Delhi, 1995
2. White, F.M., “Fluid Mechanics”, Tata McGraw-Hill, 5th 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, 2nd Edition, 2004.

22154C15P Manufacturing Technology - I

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

22148C21P NUMERICAL METHODS

1. SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS 9

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

2. INTERPOLATION AND APPROXIMATION 9

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

3. NUMERICAL DIFFERENTIATION AND INTEGRATION 9

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

4. INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 9

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

5. BOUNDARY VALUE PROBLEMS 9

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

TUTORIAL: 15
TOTAL : 60

TEXT BOOKS

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

REFERENCES

1. Kandasamy, P.Thilakavthy, K and Gunavathy, K. “Numerical Methods”, S.Chand and Co. New Delhi.1999
2. Burden, R.L and Faries, T.D., “Numerical Analysis”, Seventh Edition, Thomson Asia Pvt. Ltd., Singapore, 2002.
3. Venkatraman M.K, “Numerical Methods” National Pub. Company, Chennai, 1991
4. Sankara Rao K., “Numerical Methods for Scientists and Engineers”, 2nd Ed. Prentice Hall India. 2004

22154C22P MANUFACTURING TECHNOLOGY – II

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.

22154C23P 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.

22154C24P 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.

22154C25P 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

22148C31CP PROBABILITY AND STATISTICS

1. PROBABILITY AND RANDOM VARIABLE 9

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

2. TWO DIMENSIONAL RANDOM VARIABLES 9

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

3. STANDARD DISTRIBUTIONS 9

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

4. TESTING OF HYPOTHESIS 9

Sampling distributions – Testing of hypothesis for mean, variance, proportions and differences using Normal, t, Chi-square and F distributions - Tests for independence of attributes and Goodness of fit.

5. DESIGN OF EXPERIMENTS 9

Analysis of variance – One way classification – CRD - Two – way classification – RBD - Latin square.

Note : Use of approved statistical table permitted in the examination.

TUTORIALS 15

TOTAL : 60

TEXT BOOKS

1. Ross. S., “A first Course in Probability”, Fifth Edition, Pearson Education, Delhi 2002. (Chapters 2 to 8)
2. Johnson. R. A., “Miller & Freund’s Probability and Statistics for Engineers”, Sixth Edition, Pearson Education, Delhi, 2000. (Chapters 7, 8, 9, 12)

REFERENCES

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

22154C32P KINEMATICS OF MACHINERY

UNIT – I: BASICS OF MECHANISMS 7

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

UNIT – II: KINEMATICS 12

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

UNIT – III: CAM PROFILE 8

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

UNIT – IV: GEARS 10

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

UNIT – V: FRICTION 8

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

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

TUTORIALS 15

TOTAL HOURS : 60

TEXT BOOKS

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

REFERENCES:

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

22154C33P COMPUTER AIDED DESIGN AND MANUFACTURING

OBJECTIVES:

• To provide an overview of how computers are being used in mechanical component design

UNIT I FUNDAMENTALS OF COMPUTER GRAPHICS 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

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 and B-rep

UNIT III VISUAL REALISM 9

Hidden – Line-Surface-Solid removal algorithms – shading – colouring – computer animation.

UNIT IV ASSEMBLY OF PARTS 9

Assembly modelling – interferences of positions and orientation – tolerance analysis-mass property calculations – mechanism simulation and interference checking.

UNIT V CAD STANDARDS 9

Standards for computer graphics- **Graphical Kernel System** (GKS) - standards for exchange images- **Open G**raphics Library **(OpenGL) -** Data exchange standards - IGES, STEP, CALSetc. - communication standards.

TOTAL : 45 PERIODS

OUTCOMES:

• Upon completion of this course, the students can able to use computer and CAD software's for modeling of mechanical components

TEXT BOOKS:

1. Ibrahim Zeid “Mastering CAD CAM” Tata McGraw-Hill Publishing Co.2007

REFERENCES:

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

22154C34P ENGINEERING METROLOGY AND MEASUREMENTS

UNIT – I: INTRODUCTION 9

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

UNIT – II: LINEAR AND ANGULAR MEASURING DEVICES 9

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

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

UNIT – III: SCREW THREAD & GEAR FORM MEASUREMENT 9

Measurement of screw threads-Thread gauges, floating carriage micrometer-measurement of gears-tooth thickness-constant chord and base tangent method-.

UNIT – IV: LASER METROLOGY AND CMM 9

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

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

UNIT – V: POWER, FLOW AND TEMPERATURE MEASUREMENT 9

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

TEXT BOOKS:

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

REFERENCES:

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

4. Donald D Eckman, “Industrial Instrumentation”, Wiley Eastern, 1985.

22154L35P 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

22154C41P PROFESSIONAL ETHICS

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 imeditation 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

TEXTBOOKS:

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

REFERENCES:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009
3. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, "Fundametals 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

22154C42P 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

22154C43P 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.

22154L45P DYNAMICS LABORATORY

LIST OF EXPERIMENTS

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

Total Hours: 45

22154C51P 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.

22154C52P 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.

OBJECTIVES:

22154C53P SAFETY IN PROCESS INDUSTRIES

OBJECTIVES:

- To give the procedures in safe handling of chemicals.
- To give a knowledge about the safety equipment used in process industry.

- To give knowledge about fire safety and Emergency preparedness.

UNIT – I INTRODUCTION TO SAFETY **12**

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

UNIT – II SAFE HANDLING OF CHEMICALS **12**

Organizational Control – Identifications, labeling, safe handling, storing and transfer of chemicals – medical examination of workers – Material safety data sheet

UNIT – III SAFETY EQUIPMENT **12**

Personal protective equipment – Principle, role and types – Safe work permit system

UNIT – IV FIRE SAFETY **12**

Fire – Causes of fire – Extinguishing and classification of fire – Type of extinguisher applications – Fire hydrants.

UNIT – V EMERGENCY PREPAREDNESS **12**

Emergency – preparation of on site and off site emergency plan – data required Mock drill – Constitution and role of emergency organization.

TOTAL HOURS:60

REFERENCE:

1) Accident prevention manual, NSC, Chicago
2) Factories Act 1948
3) Safe handling of Chemicals in Industry by P.A Carson, C.J. Mamford (Vol.3)

22154L55P THERMAL ENGINEERING LABORATORY II

LIST OF EXPERIMENTS

HEAT TRANSFER **30**

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

REFRIGERATION AND AIR CONDITIONING **15**

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

Total Hours : 45

22154C61P 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.

22154C62P 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).

22154C63P MAINTENANCE ENGINEERING

OBJECTIVES:

- To enable the student to understand the principles, functions and practices adapted in industry for the successful management of maintenance activities.
- To explain the different maintenance categories like Preventive maintenance, condition

monitoring and repair of machine elements.

- To illustrate some of the simple instruments used for condition monitoring in industry.

UNIT I PRINCIPLES AND PRACTICES OF MAINTENANCE PLANNING 9

Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity

– Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance economics.

UNIT II MAINTENANCE POLICIES – PREVENTIVE MAINTENANCE 9

Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM.

UNIT III CONDITION MONITORING 9

Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis

UNIT IV REPAIR METHODS FOR BASIC MACHINE ELEMENTS 10

Repair methods for beds, slide ways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location.

UNIT V REPAIR METHODS FOR MATERIAL HANDLING EQUIPMENT 8

Repair methods for Material handling equipment - Equipment records –Job order systems - Use of computers in maintenance.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the programme, the students can able to implement the maintenance function and different practices in industries for the successful management of maintenance activities
- To identify the different maintenance categories like Preventive maintenance, condition monitoring and repair of machine elements.

TEXT BOOKS:

1. Srivastava S.K., “Industrial Maintenance Management”, S. Chand and Co., 1981
2. Venkataraman .K “Maintancence Engineering and Management”, PHI Learning, Pvt. Ltd., 2007

REFERENCES:

1. Bhattacharya S.N., “Installation, Servicing and Maintenance”, S. Chand and Co., 1995
2. White E.N., “Maintenance Planning”, I Documentation, Gower Press, 1979.
2. Garg M.R., “Industrial Maintenance”, S. Chand & Co., 1986.
3. Higgins L.R., “Maintenance Engineering Hand book”, 5th Edition, McGraw Hill, 1988.
4. Armstrong, “Condition Monitoring”, BSIRSA, 1988.
5. Davies, “Handbook of Condition Monitoring”, Chapman & Hall, 1996.
6. “Advances in Plant Engineering and Management”, Seminar Proceedings - IIPE, 1996.

22154L65P MECHATRONICS LABORATORY

LIST OF EXPERIMENTS

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

TOTAL : 45

22160C71P 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

22154C72P 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.

22154C73P ADVANCED I.C. ENGINES

OBJECTIVES:

- To update the knowledge in engine exhaust emission control and alternate fuels
- To enable the students to understand the recent developments in IC Engines

UNIT I **SPARK IGNITION ENGINES** **9**

Air-fuel ratio requirements, Design of carburetor –fuel jet size and venture size, Stages of combustion-normal and abnormal combustion, Factors affecting knock, Combustion chambers, Introduction to thermodynamic analysis of SI Engine combustion process.

UNIT II COMPRESSION IGNITION ENGINES 9

Stages of combustion-normal and abnormal combustion – Factors affecting knock, Direct and Indirect injection systems, Combustion chambers, Turbo charging, Introduction to Thermodynamic Analysis of CI Engine Combustion process.

UNIT III ENGINE EXHAUST EMISSION CONTROL 9

Formation of NO_X , HC/CO mechanism , Smoke and Particulate emissions, Green House Effect , Methods of controlling emissions , Three way catalytic converter and Particulate Trap, Emission (HC,CO, NO and NO_X ,) measuring equipments, Smoke and Particulate measurement, Indian Driving Cycles and emission norms

UNIT IV ALTERNATE FUELS 9

Alcohols , Vegetable oils and bio-diesel, Bio-gas, Natural Gas , Liquefied Petroleum Gas ,Hydrogen , Properties , Suitability, Engine Modifications, Performance , Combustion and Emission Characteristics of SI and CI Engines using these alternate fuels.

UNIT V RECENT TRENDS 9

Homogeneous Charge Compression Ignition Engine, Lean Burn Engine, Stratified Charge Engine, Surface Ignition Engine, Four Valve and Overhead cam Engines, Electronic Engine Management, Common Rail Direct Injection Diesel Engine, Gasoline Direct Injection Engine, Data Acquisition System –pressure pick up, charge amplifier PC for Combustion and Heat release analysis in Engines.

TOTAL: 45 PERIODS

TEXT BOOK:

1. Heinz Heisler, ‘Advanced Engine Technology,” SAE International Publications, USA,1998
2. Ganesan V..” Internal Combustion Engines” , Third Edition, Tata McGraw-Hill ,2007

REFERENCES:

1. John B Heywood,” Internal Combustion Engine Fundamentals”, Tata McGraw-Hill 1988
2. Patterson D.J. and Henein N.A,“Emissions from combustion engines and their control,” Ann Arbor Science publishers Inc, USA, 1978
3. Gupta H.N, “Fundamentals of Internal Combustion Engines” ,Prentice Hall of India, 2006
4. Ultrich Adler ,” Automotive Electric / Electronic Systems, Published by Robert Bosh GmbH,1995

LIST OF ELECTIVES

22154E44AP 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

22154E44BP WELDING TECHNOLOGY

OBJECTIVES

- 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 V DESIGN OF WELD JOINTS, WELDABILITY AND TESTING OF WELDMENTS 9

Various weld joint designs – Weldability of Aluminium, Copper, and Stainless steels. Destructive and non destructive testing of weldments.

TOTAL : 45 HOURS

OUTCOMES:

 Upon completion of this course, the students can able to compare different types of Welding process for effective Welding of Structural components.

TEXT BOOKS:

1. Parmer R.S., “Welding Engineering and Technology”, 1st edition, Khanna Publishers, New Delhi, 2008.

2. Parmer R.S., “Welding Processes and Technology”, Khanna Publishers, New Delhi, 1992.

3. Little R.L., “Welding and welding Technology”, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 34th reprint, 2008.

REFERENCES:

1. Schwartz M.M. “Metals Joining Manual”. McGraw Hill Books, 1979.

2. Tylecote R.F. “The Solid Phase Welding of Metals”. Edward Arnold Publishers Ltd. London, 1968.

3. AWS- Welding Hand Book. 8th Edition. Vol- 2. “Welding Process”

4. Nadkarni S.V. “Modern Arc Welding Technology”, 1st edition, Oxford IBH Publishers, 2005.

5. Christopher Davis. “Laser Welding- Practical Guide”. Jaico Publishing House, 1994.

6. Davis A.C., “The Science and Practice of Welding”, Cambridge University Press, Cambridge,

REFERENCES:

1. ASM Metals Handbook, ”Non-Destructive Evaluation and Quality Control”, American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.

2. ASNT, American Society for Non Destructive Testing, Columbus, Ohio, NDT Handbook,Vol. 1, Leak Testing, Vol. 2, Liquid Penetrant Testing, Vol. 3, Infrared and Thermal Testing Vol. 4, Radiographic Testing, Vol. 5, Electromagnetic Testing, Vol. 6, Acoustic Emission Testing, Vol. 7, Ultrasonic Testing

3. Charles, J. Hellier,“ Handbook of Nondestructive evaluation”, McGraw Hill, New York 2001.

1. 4. Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley, 2nd Edition New Jersey, 2005

22154E44CP FUNDAMENTALS OF NANOSCIENCE

OBJECTIVES

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

UNIT I INTRODUCTION 8

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-

Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilmsmultilayered
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, Nanoclaysfunctionalization 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. Edelstein. A.S. and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. John Dinardo. N, “Nanoscale charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. Timp .G, “Nanotechnology”, AIP press/Springer, 1999.
2. Akhlesh Lakhtakia (Editor),“The Hand Book of Nano Technology, Nanometer Structure,

22154E44DP 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.

22158E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineral resources: use and effects on forests and tribal people – water resources: use and over-utilization of surface and exploitation, environmental effects of extracting and using mineral resources, case studies – food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – energy resources: growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies – land resources: land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT II ECOSYSTEMS AND BIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem. Introduction to biodiversity – definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity –endangered and endemic species of India – conservation of biodiversity: in-situ and ex-situ conservation of biodiversity.

UNIT III ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards — role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management
environmental ethics: issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents. environment production act – air (prevention and control of pollution) act – water (prevention and control of pollution) act – wildlife protection act – forest conservation act – issues involved in enforcement of environmental legislation – public awareness

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

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

TOTAL : 45

TEXT BOOKS

1. Gilbert M .Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. Miller T.G. Jr., “Environmental Science”, Wadsworth Publishing Co.

REFERENCES

1. Bharucha Erach, “The Biodiversity of India”, Mapin Publishing Pvt. Ltd., Ahmedabad India.

2. Trivedi R.K., "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
3. Cunningham, W.P.Cooper, T.H.Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998.
5. Townsend C., Harper J and Michael Begon, "Essentials of Ecology, Blackwell Science.
6. Trivedi R.K. and P.K. Goel, Introduction to Air Pollution, Techno-Science Publications

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22154E54BP HUMAN RIGHTS

OBJECTIVES :

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

UNIT I 9

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

Solidarity Rights.

UNIT II 9

Evolution of the concept of Human Rights 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.

22154E54CP 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

22154E54DP MARKETING MANAGEMENT

OBJECTIVES:

 To enable students to deal with newer concepts of marketing concepts like strategic marketing segmentation, pricing, advertisement and strategic formulation. The course will enable a student to take up marketing as a professional career.

UNIT I MARKETING PROCESS 9

Definition, Marketing process, dynamics, needs, wants and demands, marketing concepts, environment, mix, types. Philosophies, selling versus marketing, organizations, industrial versus consumer marketing, consumer goods, industrial goods, product hierarchy.

UNIT II BUYING BEHAVIOUR AND MARKET SEGMENTATION 9

Cultural, demographic factors, motives, types, buying decisions, segmentation factors - demographic -
Psycho graphic and geographic segmentation, process, patterns.

UNIT III PRODUCT PRICING AND MARKETING RESEARCH 9

Objectives, pricing, decisions and pricing methods, pricing management. Introduction, uses, process
of marketing research.

UNIT IV MARKETING PLANNING AND STRATEGY FORMULATION 9

Components of marketing plan-strategy formulations and the marketing process, implementations,
portfolio analysis, BCG, GEC grids.

UNIT V 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, Modern Trends, e-Marketing.

TOTAL: 45 PERIODS

OUTCOMES :

 The learning skills of Marketing will enhance the knowledge about Marketer’s Practices and create insights on Advertising, Branding, Retailing and Marketing Research.

TEXT BOOKS:

1. Philip Kolter & Keller, “Marketing Management”, Prentice Hall of India, 14th edition, 2012.
2. Chandrasekar. K.S., “Marketing Management Text and Cases”, 1st Edition, Tata McGraw Hill –
Vijaynicole, 2010.

REFERENCES:

1. Ramasamy and Nama kumari, “Marketing Environment: Planning, implementation and control
the Indian context”, 1990.
2. Czinkota&Kotabe, “Marketing management”, Thomson learning, Indian edition 2007
3. Adrain palmer, “ Introduction to marketing theory and practice”, Oxford university press IE 2004.
4. Donald S. Tull and Hawkins, “Marketing Reasearch”, Prentice Hall of Inida-1997.

22154E64AP PRINCIPLES OF MANAGEMENT

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 andcontingency 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 anddecentralization – 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 andperformance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:

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

TEXTBOOKS:

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

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management” 7th Edition, Pearson Education, 2011.
2. Robert Kreitner & Mamata Mohapatra, “ Management”, Biztantra, 2008.

22154E64BP ENERGY CONSERVATION AND MANAGEMENT

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 8

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 12

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 andscope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 12

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 8

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

UNIT V ECONOMICS 5

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 carryout 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.

22154E64CP ENGINEERING ECONOMICS

OBJECTIVES:

- To enable students to understand the fundamental economic concepts applicable to engineering and to learn the techniques of incorporating inflation factor in economic decision making.

UNIT I INTRODUCTION TO ECONOMICS 8

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis - V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT II VALUE ENGINEERING 10

Make or buy decision, Value engineering – Function, aims, Value engineering procedure. Interest formulae and their applications –Time value of money, Single payment compound amount factor, Single payment present worth factor, Equal payment series sinking fund factor, Equal payment series payment Present worth factor- equal payment series capital recovery factor - Uniform gradient series annual equivalent factor, Effective interest rate, Examples in all the methods.

UNIT III CASH FLOW 9

Methods of comparison of alternatives – present worth method (Revenue dominated cash flow diagram), Future worth method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), Annual equivalent method (Revenue dominated cash flow diagram, cost dominated cash flow diagram), rate of return method, Examples in all the methods.

UNIT IV REPLACEMENT AND MAINTENANCE ANALYSIS 9

Replacement and Maintenance analysis – Types of maintenance, types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset – capital recovery with return and concept of challenger and defender, Simple probabilistic model for items which fail completely.

UNIT V DEPRECIATION 9

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation/ Annuity method of depreciation, service output method of depreciation-Evaluation of public alternatives- introduction, Examples, Inflation adjusted decisions – procedure to adjust inflation, Examples on comparison of alternatives and determination of economic life of asset.

TOTAL: 45 PERIODS

OUTCOMES :

 Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions.

TEXT BOOKS:

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.

REFERENCES:

1. Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2011.
2. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg. Press, Texas, 2010.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, New York, 2011.
4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012
.

22148E64DP MATHEMATICS FOR INDUSTRIAL OPERATIONS

Unit I Introduction to Linear Programming (LP)

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

Unit II Transportation and Assignment models

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

Unit III Integer Linear Programming and Game Theory

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

Unit IV Dynamic Programming, Simulation and Decision Theory

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

Unit V Queuing Theory and Replacement Models

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

Total no. of hrs: 60 hrs.

TEXT BOOK

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

REFERENCES BOOKS

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

22154E74AP ADDITIVE MANUFACTURING

OBJECTIVES:

 To know the principle methods, areas of usage, possibilities and limitations as well as environmental effects of the Additive Manufacturing technologies

 To be familiar with the characteristics of the different materials those are used in Additive Manufacturing.

UNIT I INTRODUCTION 10

Overview – History - Need-Classification -Additive Manufacturing Technology in product development-Materials for Additive Manufacturing Technology – Tooling - Applications.

UNIT II CAD & REVERSE ENGINEERING 10

Basic Concept – Digitization techniques – Model Reconstruction – Data Processing for Additive Manufacturing Technology: CAD model preparation – Part Orientation and support generation – Model Slicing –Tool path Generation – Softwares for Additive Manufacturing Technology: MIMICS, MAGICS.

UNIT III LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING SYSTEMS 10

Classification – Liquid based system – Stereolithography Apparatus (SLA)- Principle, process, advantages and applications - Solid based system –Fused Deposition Modeling - Principle, process, advantages and applications, Laminated Object Manufacturing

UNIT IV POWDER BASED ADDITIVE MANUFACTURING SYSTEMS 10

Selective Laser Sintering – Principles of SLS process - Process, advantages and applications, Three Dimensional Printing - Principle, process, advantages and applications- Laser Engineered Net Shaping (LENS), Electron Beam Melting.

UNIT V MEDICAL AND BIO-ADDITIVE MANUFACTURING 5

Customized implants and prosthesis: Design and production. Bio-Additive Manufacturing-Computer Aided Tissue Engineering (CATE) – Case studies

TOTAL : 45 PERIODS

OUTCOMES:

 Upon completion of this course, the students can able to compare different method and discuss the effects of the Additive Manufacturing technologies and analyse the characteristics of the different materials in Additive 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. Gebhardt A., “Rapid prototyping”, Hanser Gardener Publications, 2003.

REFERENCES:

1. Liou L.W. and Liou F.W., “Rapid Prototyping and Engineering applications : A tool box for prototype development”, CRC Press, 2007.

2. Kamrani A.K. and Nasr E.A., “Rapid Prototyping: Theory and practice”, Springer, 2006.

3. Hilton P.D. and Jacobs P.F., “Rapid Tooling: Technologies and Industrial Applications”, CRC press, 2000.

22154E74BP COMPUTATIONAL FLUID DYNAMICS

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 8

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 10

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 completion of this course, the students can able

- To create numerical modeling and its role in the field of fluid flow and heat transfer
- To use the various discretization methods, solution procedures and turbulence modeling to solve flow and heat transfer problems.

TEXT BOOKS:

1. Versteeg, H.K., and Malalasekera, W., "An Introduction to Computational Fluid Dynamics: The
finite volume Method", Pearson Education Ltd.Second Edition, 2007.
2. Ghoshdastidar, P.S., "Computer Simulation of flow and heat transfer", Tata McGraw Hill Publishing Company Ltd., 1998.

REFERENCES:

1. Patankar, S.V. "Numerical Heat Transfer and Fluid Flow", Hemisphere Publishing Corporation,

2004.
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, 1995.
5. ProdipNiyogi, Chakrabarty, S.K., Laha, M.K. "Introduction to Computational Fluid Dynamics",
Pearson Education, 2005.
6. Anil W. Date "Introduction to Computational Fluid Dynamics" Cambridge University Press, 2005.

22154E74CP 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*).*

22154E74DP DISASTER MANAGEMENT

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.

TEXTBOOK:

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.

PONNAIYAH RAMAJAYAM INSTITUTE OF SCIENCE & TECHNOLOGY (PRIST)

Declared as DEEMED-TO-BE-UNIVERSITY
U/s 3 of UGC Act, 1956

Mapping of Courses to Cross cutting Issues

Department of Electrical and Electronics Engineering (R-2022)

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 -22 UGEEEPT	22148S11P	Transforms and Partial Differential Equations					✓			
B.Tech -22 UGEEEPT	22153C12P	Control System								
B.Tech -22 UGEEEPT	22153C13P	Circuit Theory								
B.Tech -22 UGEEEPT	22153C14P	Electronic circuits								
B.Tech -22 UGEEEPT	22153C15P	Electrical Machines-I								
B.Tech -22 UGEEEPT	22148S21P	Numerical Methods					✓			
B.Tech -22 UGEEEPT	22153C22P	Optimization Techniques								
B.Tech -22 UGEEEPT	22153C23P	Electrical Machines-II								
B.Tech -22 UGEEEPT	22153C24P	Digital Electronics								

B.Tech -22 UGEEEPT	22153C25P	Transmission and Distribution								
B.Tech -22 UGEEEPT	22148S31CP	Probability and Statistics					✓			
B.Tech -22 UGEEEPT	22153C32P	Linear Integrated Circuits and Applications								
B.Tech -22 UGEEEPT	22153C33P	Power Electronics								
B.Tech -22 UGEEEPT	22153C34P	Measurements and Instrumentation								
B.Tech -22 UGEEEPT	22153L35P	DC and AC Electrical Machines Laboratory								
B.Tech -22 UGEEEPT	22153C41P	Protection and switch gear								
B.Tech -22 UGEEEPT	22153C42P	High Voltage DC Transmission								
B.Tech -22 UGEEEPT	22153C43P	Solid State Drives								
B.Tech -22 UGEEEPT	22153E44AP	Circuit Theory								
B.Tech -22 UGEEEPT	22153L45P	Control and Instrumentation Laboratory								
B.Tech -22 UGEEEPT	22153C51P	Power System Analysis								
B.Tech -22 UGEEEPT	22153C52P	Power Quality				✓				
B.Tech -22 UGEEEPT	22153C53P	Special Electrical Machines								
B.Tech -22 UGEEEPT	22153E54AP	Environmental Science and Engineering						✓		
B.Tech -22 UGEEEPT	22153C61P	Utilization of Electrical Energy								
B.Tech -22 UGEEEPT	22153C62P	Solid State Relays								
B.Tech -22 UGEEEPT	22153C63P	Power System Operation and Control								
B.Tech -22 UGEEEPT	22153E64AP	Principles of Management					✓			
B.Tech -22 UGEEEPT	22160S71P	Total Quality Management					✓			
B.Tech -22 UGEEEPT	22153C72P	Electrical Machine Design								
B.Tech -22 UGEEEPT	22153C73P	Power Plant Engineering								
B.Tech -22 UGEEEPT	22153E74EP	Switched Mode Power supplies								

B.Tech -22 UGEEEPT	22153P75P	Project Work								
M.Tech - 22PG PS PT	22248S11DP	Applied Mathematics forPower System Engineering					✓			
M.Tech - 22PG PS PT	22272C12P	System Theory								
M.Tech - 22PG PS PT	22272C13P	Advanced Power System Analysis								
M.Tech - 22PG PS PT	22272L14P	Power System Simulation Laboratory								
M.Tech - 22PG PS PT	22272C21P	EHV power transmission.								
M.Tech - 22PG PS PT	22272C22P	Advanced Power System Protection								
M.Tech - 22PG PS PT	22272E23CP	Advanced Power System Dynamics				✓				
M.Tech - 22PG PS PT	222TECWRP	Technical Writing/Seminars					✓			
M.Tech - 22PG PS PT	22272C31P	Economic Operations of Power Systems								
M.Tech - 22PG PS PT	22272C32P	HVDC and FACTS								
M.Tech - 22PG PS PT	22272E33AP	Smart Grid								
M.Tech - 22PG PS PT	22272L34P	Advanced Power System Simulation Laboratory								
M.Tech - 22PG PS PT	22272C41P	Power System Control								
M.Tech - 22PG PS PT	22272C42P	Electrical Transients inpower systems								
M.Tech - 22PG PS PT	22272E43DP	Energy Managementand Auditing					✓			
M.Tech - 22PG PS PT	22272P44P	Project work Phase –I								
M.Tech - 22PG PS PT	22272E51BP	Power system Dynamics								
M.Tech - 22PG PS PT	22275E52AP	Power Conditioning								
M.Tech - 22PG PS PT	22272E53CP	Soft Computing Techniques					✓			

M.Tech - 22PG PS FT	22248S11D	Applied Mathematics for Power System Engineering					✓			
M.Tech - 22PG PS FT	22272C12	System Theory								
M.Tech - 22PG PS FT	22272C13	Advanced Power System Analysis								
M.Tech - 22PG PS FT	22272C14	Economic Operations of Power Systems								
M.Tech - 22PG PS FT	22272C15	HVDC and FACTS								
M.Tech - 22PG PS FT	22272E16C	Advanced Power System Dynamics				✓				
M.Tech - 22PG PS FT	22272L17	Power System Simulation Laboratory								
M.Tech - 22PG PS FT	22272C21	EHV power transmission								
M.Tech - 22PG PS FT	22272C22	Power System Control								
M.Tech - 22PG PS FT	22272C23	Advanced Power System Protection								
M.Tech - 22PG PS FT	22272E24A	Smart Grid								
M.Tech - 22PG PS FT	22272E25B	AI Techniques to Power Systems				✓				
M.Tech - 22PG PS FT	22272L26	Advanced Power System Simulation Laboratory								
M.Tech - 22PG PS FT	22272C31	Electrical Transients in power systems								
M.Tech - 22PG PS FT	22272E32B	Power system Dynamics								
M.Tech - 22PG PS FT	22272E33D	Principles of EHV Transmission								
M.Tech - 22PG PS FT	22272E34C	Soft Computing Techniques					✓			
M.Tech - 22PG PS FT	22272P35	Project work Phase-I								
M.Tech - 22PG PS FT	22272P41	Project work Phase-II								

1.3.1SUPPORTINGDOCUMENTS

Courses(offeredin2022-23)whichaddresstheGenderSensitization,HumanValues,

Professional Ethics, Environment and sustainability.

SCHOOLOFENGINEERINGANDTECHNOLOGY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

GenderSensitizationandHumanValues	
ProfessionalEthics	
HumanValues	
Environmentandsustainability	
ProfessionalEthics&HumanValues	

COURSE STRUCTURE

B.TECHPTEEE R2022

B.Tech (PT)EEER22

SEMESTERI

Sl. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22148S11P	TransformsandPartial Differential Equations	3	1	0	4
2	22153C12P	ControlSystem	3	1	0	4
3	22153C13P	CircuitTheory	3	1	0	4
4	22153C14P	Electroniccircuits	3	0	0	3
5	22153C15P	ElectricalMachines-I	4	0	0	4
TotalNo ofCredits						**19**

SEMESTERII

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22148S21P	NumericalMethods	3	1	0	4
2	22153C22P	OptimizationTechniques	3	0	0	3
3	22153C23P	ElectricalMachines-II	3	1	0	4
4	22153C24P	DigitalElectronics	3	1	0	4
5	22153C25P	TransmissionandDistribution	4	0	0	4
TotalNo ofCredits						**19**

SEMESTER III

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22148S31CP	ProbabilityandStatistics	3	1	0	4
2	22153C32P	LinearIntegratedCircuits and Applications	3	1	0	4
3	22153C33P	PowerElectronics	4	0	0	4
4	22153C34P	Measurementsand Instrumentation	4	0	0	4
5	22153L35P	DCandACElectrical MachinesLaboratory	0	0	3	2
TotalNo ofCredits						**20**

SEMESTERIV

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153C41P	Protectionandswitchgear	4	0	0	4
2	22153C42P	HighVoltageDC Transmission	3	1	0	4
3	22153C43P	SolidStateDrives	3	1	0	4
4	22153E44_P	Elective –I	4	0	0	4
5	22153L45P	Control andInstrumentation Laboratory	0	0	3	2
TotalNo ofCredits						**18**

SEMESTERV

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153C51P	PowerSystemAnalysis	3	1	0	4
2	22153C52P	PowerQuality	3	1	0	4
3	22153C53P	SpecialElectricalMachines	4	0	0	4
4	22153E54_P	Elective–II	4	0	0	4
5	22153L55P	PowerElectronicsand Drives Lab	0	0	3	2
TotalNo ofCredits						**18**

SEMESTERVI

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153C61P	UtilizationofElectrical Energy	3	1	0	4
2	22153C62P	SolidStateRelays	4	0	0	4
3	22153C63P	PowerSystemOperation and Control	4	0	0	4
4	22153E64_P	Elective–III	4	0	0	4
5	22153L65P	PowerSystemsLab	0	0	3	2
TotalNo ofCredits						**18**

SEMESTERVII

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22160S71P	TotalQualityManagement	3	0	0	3
2	22153C72P	ElectricalMachineDesign	3	1	0	4
3	22153C73P	PowerPlantEngineering	4	0	0	4
4	22153E74_P	Elective–IV	3	0	0	3
5	22153P75P	Project Work	0	0	12	6
TotalNo ofCredits						**20**

LISTOFELECTIVES

ELECTIVE–I(IVSEMESTER)

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153E44AP	CircuitTheory	4	0	0	4
2	22153E44BP	FuzzyLogicandits Applications	4	0	0	4
3	22153E44CP	Bio Medical Instrumentation	4	0	0	4
4	22153E44DP	ModelingandSimulation ofSolarEnergySystems	4	0	0	4
5	22153E44EP	Nonconventionalenergy system& Applications	4	0	0	4

ELECTIVE–II(VSEMESTER)

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153E54AP	EnvironmentalScienceand Engineering	4	0	0	4
2	22153E54BP	ArtificialNeuralNetworks	4	0	0	4
3	22153E54CP	VLSIDesign	4	0	0	4
4	22153E54DP	Robotics	4	0	0	4
5	22153E54EP	LT&HTDistribution System	4	0	0	4

ELECTIVE–III(VISEMESTER)

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153E64AP	PrinciplesofManagement	4	0	0	4
2	22153E64BP	MicroElectroMechanical Systems	4	0	0	4
3	22153E64CP	Integratedopto-Electronic Devices	4	0	0	4
4	22153E64DP	ComputerAidedDesignof Electrical Apparatus	4	0	0	4
5	22153E64EP	AdvancedDC-ACPower Conversion	4	0	0	4

ELECTIVE–IV(VIISEMESTER)

S. No	Subject Code	SubjectName	PeriodsPerWeek			C
			L	T	P	
1	22153E74AP	Powersystemtransients	3	0	0	3
2	22153E74BP	EHV AC and DC Transmissionsystems	3	0	0	3
3	22153E74CP	Fundamentalsof Nanoscience	3	0	0	3
4	22153E74DP	AdvancedControlsystems	3	0	0	3
5	22153E74EP	SwitchedModePower Supplies	3	0	0	3

HOD **DEAN**

DEANACADEMICAFFAIRS

22148S11P-TRANSFORMSANDPARTIALDIFFERENTIALEQUATIONS

310 4

(Commontoall) **SEMESTER-1**

UNITI FOURIERSERIES 9 +3hrs

Periodic function-Graph of functions- Fourier series – Odd and even functions – Halfrange sine series – Half range cosine series – Complex form of Fourier Series– Parseval's identity – Harmonic Analysis.

UNITII FOURIERTRANSFORM 9 +3hrs

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

UNITIIIZ-TRANSFORMANDDIFFERENCE EQUATIONS9+3hrs

Z-transform-Elementaryproperties(withoutproof)–InverseZ–transform–Convolutiontheorem-Formationofdifferenceequations–Solutionofdifference equationsusingZ–transform-Samplingofsignals–an introduction.

UNITIV PARTIALDIFFERENTIALEQUATIONS 9+3hrs

Formationofpde–solutionofstandardtypefirstorderequation-Lagrange'slinearequation–Linearpartialdifferentialequationsofsecondorderandhigherorderwith Constantcoefficients.

UNITV BOUNDARYVALUE 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**

COURSEOUTCOMES

- Appreciate the physical significanceofFourierseriestechniquesinsolvingone and two dimensional heat flow problems and one dimensionalwave 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 Ztransform techniques for discrete time systems.

TEXT BOOKS

1. Andrews,L.A.,andShivamoggiB.K.,“IntegralTransformsforEngineersand Applied

   Mathematicians”,Macmillen,NewYork,2288.
2. Grewal,B.S.,“HigherEngineeringMathematics”,ThirtySixthEdition,Khanna Publishers,

   Delhi, 2001.
3. Kandasamy, P., Thilagavathy, K., and Gunavathy,K., “Engineering Mathematics Volume

   III”,S.Chand&Companyltd.,NewDelhi,1996.

REFERENCEBOOKS

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”, FourthEdition, McGraw-Hill Book Co., Singapore, 1987.
3. AdvancedModernEngineeringmathematics–GlynJames

22153C12P-CONTROLSYSTEM 3104

SEMESTER-1

AIM

To provide sound knowledge in the basic concepts of linear controltheoryand design of control system.

OBJECTIVES

i. Tounderstandthemethodsofrepresentationofsystemsandgettingtheirtransfer function models.
ii. Toprovideadequateknowledgeinthetimeresponseofsystemsandsteadystate error analysis.
iii. Togivebasicknowledgeisobtainingtheopenloopandclosed–loopfrequency responses of systems.
iv. Tounderstandtheconceptofstabilityofcontrolsystemandmethodsofstability analysis.
v. Tostudythethreewaysofdesigningcompensationforacontrolsystem.

UNITI:INTRODUCTION 12

Open-loop and closed –loop systems, servomechanisms and regulator systems; Transfer function; Block diagram reduction, Signal flow graphs.

UNITII:MATHEMATICALMODELSOFPHYSICALSYSTEMS 12

Mechanical systems - Translational and Rotational systems, Gear trains, Electrical systems, Thermal systems and Fluid systems.
Componentsoffeedbackcontrolsystems-Potentiometersaserrorsensingdevices, Synch, Servomotors, Stepper motors, Tachogenerators.

UNITIII:STABILITY 12

ConceptofStability,necessaryandsufficientconditionsofStability,Closed-loop systems, merits and demerits, Routh-Hurwitz Criterion.
TransientResponse:Typicalinputs,convolutionintegral,Timedomainspecifications, steady state errors.
Stateequation–Solutions–Realization–Controllability–Observability–Stability Jury’s test.

UNITIV:FREQUENCY RESPONSE 12

Definition, equivalence between transient response and frequency response, Bode plots. Nyquist StabilityCriterion: Development ofcriterion, gainandphase margins, m- circles and Nichol’s chart.

UNITV: ROOTLOCUS METHOD 12

Rulesforsketchingofrootloci,Rootcontours.
Synthesis:LagandLeadnetworks,proportional,derivativeandintegralcontrollers.
MUTLIINPUTMULTIOUTPUT(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

COURSEOUTCOMES

Attheendofthecourse,thestudent should havethe:

- Abilitytodevelop variousrepresentationsofsystembasedontheknowledge of
- Mathematics,ScienceandEngineeringfundamentals.
- Abilitytodotimedomainand frequencydomainanalysisofvariousmodelsof linear system.
- Abilitytointerpretcharacteristicsofthesystemtodevelopmathematicalmodel.
- Abilitytodesignappropriatecompensatorforthegivenspecifications.
- Abilitytocomeout withsolutionforcomplexcontrolproblem.
- AbilitytounderstanduseofPIDcontrollerinclosedloopsystem.

TEXT BOOK:

1. I.J.Nagrathand M.Gopal, ‘ControlSystemEngineering’, WileyEastern Ltd., Reprint 1995.

REFERENCES:

1. M.Gopal,‘ControlSystemPrinciplesandDesign’,TataMcGrawHill,1998.
2. Ogatta,‘ModernControlEngineering’,TataMcGrawHill1997.

22153C13P-CIRCUITTHEORY

3103
SEMESTER-1

AIM

Toknowaboutbasicanalysisandsynthesistechniquesusedinelectronicsand communications.

OBJECTIVES

- Tointroduceelectriccircuitsanditsanalysis
- Toimpartknowledgeonsolvingcircuitsusingnetworktheorems
- Tointroducethephenomenonofresonanceincoupledcircuits.
- Toeducateonobtainingthetransientresponseofcircuits.
- ToPhasordiagramsandanalysisofthreephasecircuits

UNIT-IBASICCIRCUITSANALYSIS (9)

Ohm's Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.

UNIT-II NETWORK REDUCTION AND NETWORK THEOREMS FORDC ANDACCIRCUITS (9)

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem..

UNIT-IIIRESONANCEANDCOUPLEDCIRCUITS (9)

Seriesandparalledresonance–theirfrequencyresponse–QualityfactorandBandwidth - Self andmutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

UNIT-IVTRANSIENTRESPONSEFORDCCIRCUITS (9hrs)

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input – Characterization of two port networks in terms of Z,Y and hparameters.

UNIT-VTHREEPHASECIRCUITS (9hrs)

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

TOTAL 45

COURSEOUTCOMES

- Abilityanalyseelectricalcircuits
- Abilitytoapplycircuittheorems
- AbilitytoanalyseACandDCCircuits

TEXT BOOKS:

1. WilliamH.HaytJr,JackE.KemmerlyandStevenM.Durbin,“Engineering CircuitsAnalysis”, Tata McGrawHillpublishers,6thedition, NewDelhi, 2003.

2. JosephA.Edminister,MahmoodNahri,“Electriccircuits”,Schaum’sseries, Tata McGraw-Hill, New Delhi, 2001.

REFERENCES:

1. ParanjothiSR,“ElectricCircuitsAnalysis,”NewAgeInternationalLtd.,New Delhi, 1996.

2. SudhakarAandShyamMohanSP,“CircuitsandNetworkAnalysisand Synthesis”, Tata McGraw Hill, 2007.

3. ChakrabatiA,“CircuitsTheory(Analysisandsynthesis),DhanpathRai&Sons, New Delhi, 1999.

4. CharlesK.Alexander,MathewN.O.Sadiku,“FundamentalsofElectricCircuits”, Second Edition, McGraw Hill, 2003.

22153C14P-ELECTRONICCIRCUITS

3003
SEMESTER-1

AIM:
Tostudythecharacteristics andapplicationsofelectronicdevices.

OBJECTIVES:

- To acquaint the students withconstruction, theoryand characteristics ofthe following electronic devices:
- Bipolar transistor, Field Effect transistor, Multivibrators, Power control/regulator devices, Feedback amplifiers and oscillators

UNITI -RECTIFIER&POWERSUPPLY 12
Half & Full wave rectifier – filters – shunt , inductor, LC section & Ripple factor, P calculation for C, Land LC filters – Voltage regulators – Zener –Series voltage regulator – SMPS.

UNITII-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.

UNITIII- FEEDBACKAMPLIFER&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.

UNITIV-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.

UNITV-POWERAMPLIFIER 12
Classification – class A, B, C & AB – Class B push pull – Class B Complimentary – symmetry– Class S, Powersections classification – Efficiency– Distortion inamplifiers.

L= 45T =15P= 0TOTAL=60

COURSEOUTCOMES

- UponCompletionofthe course,the studentswillbe abilityto:
- Explainthestructureandworkingoperationofbasicelectronicdevices.
- Abletoidentifyanddifferentiatebothactiveandpassiveelements
- Analyzethecharacteristicsofdifferentelectronicdevicessuchasdiodesand transistors
- Chooseandadapttherequiredcomponentstoconstructanamplifiercircuit. Employ the acquired knowledge in design and analysis of oscillators

REFERENCEBOOKS:

1. David.A.Bell,“SolidStatePulseCircuits”,PrenticeHallofIndia,4th Edition,2001.
2. MillmanTaub.H,“PulseDigital&Switchingwaveform”,TataMcGRawHill International 2001.
3. JacobMillmanCristasC.Halkias,“IntegratedElectronics”,TatMcGrawHill,Edition 1991.

22153C15P-ELECTRICALMACHINES–I 40 04

AIM **SEMESTER-1**

To expose the students to the concepts of electromechanical energy conversions in D.C. Machines and energytransfer in transformers and to analyze their performance.

OBJECTIVES

i. To introduce the concept ofrotating machines and the principle ofelectromechanical energy conversion in single and multiple excited systems.
ii. To understand the generation of D.C. voltages by using different type of generatorsand study their performance.
iii. Tostudytheworking principles ofD.C. motorsandtheir loadcharacteristics, 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 estimatethevarious losses takingplace inD.C. machines and transformers and to study the different testing method to arrive at their performance.

UNITI: BASICPRINCIPLES OFROTATINGMACHINES 12

Electrical machine types – Magnetic circuits – Magnetically induced EMF and force – AC operation of magnetic circuits - core losses. Principles of Electromechanical energy conversion:Energyconversionprocess–Energyinmagneticsystem–Fieldenergyand mechanical force – Multiply excited magnetic field systems

UNITII: GENERATORS 12

Constructional details – emf equation – Methods of excitation – Self and separately excitedgenerators –Characteristicsofseries,shuntandcompoundgenerators –Armature reaction and commutation – Parallel operation of DC shunt and compound generators.

UNITIII: DCMOTORS 12

Principle of operation – Back emf and torque equation – Characteristics of series, shunt and compoundmotors – Starting ofDC motors – Types of starters – Speed control of DC series and shunt motors.

UNITIV:TRANSFORMERS 12

Constructionaldetailsof core andshelltypetransformers–Typesofwindings–Principle ofoperation– emfequation–Transformationratio - Equivalent circuit – Losses–Testing – Efficiency and Voltage regulation . Transformer on load– Parallel operation of single phase transformers – Auto transformer – Three phase transformers

UNITV:TESTINGOFTRANSFORMERSANDDCMACHINES 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’stest–Testingoftransformers –Polaritytest,loadtest,opencircuitandshort circuit tests – All day efficiency.

TOTAL=60

COURSEOUTCOMES

- Abilitytoanalyzethemagnetic-circuits.
- Abilitytoacquiretheknowledgeinconstructionaldetailsoftransformers.Ability to understand the concepts of electromechanical energy conversion. Ability to acquire the knowledge in working principles of DC Generator.
- Abilitytoacquiretheknowledgeinworkingprinciplesof DCMotor
- Abilitytoacquiretheknowledgeinvariouslossestakingplacein D.C.Machines

TEXT BOOKS

1. D.P.Kothariand I.J.Nagrath,‘ElectricMachines’,TataMcGrawHillPublishing Company Ltd, 2002.

2. P.S.Bimbhra,‘ElectricalMachinery’,KhannaPublishers,2003.

REFERENCEBOOKS

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.MurugeshKumar,‘ElectricMachines’,VikaspublishinghousePvtLtd,2002.

4. V.K.Mehta and Rohit Mehta, ‘Principles of Power System’, S.Chand andCompany Ltd, third edition, 2003.

22148S21P-NUMERICAL METHODS

3104

SemesterII

UNITI - SOLUTIONOFEQUATIONSANDEIGENVALUEPROBLEMS

9+3hrs

Solution of equations–Newton Raphson's method, Regula-falsi methods Solution of linear Systemofequations byGaussian elimination and Gauss-Jordon methods-Iterativemethods: Gauss Jacobi and Gauss-Seidel methods– Eigenvalue of a matrix by powermethod.

UNITII- INTERPOLATION 9+3hrs

Newton'sforwardandbackwarddifferenceformulas–Centraldifferenceformula:Bessels and Stirling's formula - Lagrangian Polynomials – Divided difference method.

UNITIII- NUMERICALDIFFERENTIATIONANDINTEGRATION

9+3hrs

Derivatives from difference tables – Divided differences and finite differences – NumericalintegrationbytrapezoidalandSimpson's1/3and3/8rules –Romberg'smethod – Double integrals using trapezoidal and Simpson's rules.

UNITIV- INITIALVALUEPROBLEMSFORORDINARYDIFFERENTIAL EQUATIONS 9+3hrs

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

UNIT V - BOUNDARY VALUEPROBLEMS IN ORDINARY AND PARTIALDIFFERENTIAL EQUATIONS 9+3hrs

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

Totalno ofhrs:60hrs

COURSEOUTCOMES

- Understandthebasicconceptsandtechniquesofsolvingalgebraicequations.
- Appreciatethenumericaltechniquesofinterpolationanderrorapproximations in various intervals in real lifesituations.
- Applythenumericaltechniquesofdifferentiationandintegrationfor engineering problems.
- Understand the knowledge of various techniques and methods for solving first and second order ordinary differential equations.

TEXT BOOKS

1. Gerald,C.F,andWheatley,P.O,"AppliedNumericalAnalysis",SixthEdition, Pearson Education Asia, New Delhi, 2002.
2. Kandasamy, P., Thilagavathy,K. and Gunavathy, K., "Numerical Methods", S.Chand Co. Ltd., New Delhi, 2003.

REFERENCESBOOKS

1. Burden,R.LandFaires,T.D.,"NumericalAnalysis",SeventhEdition,Thomson Asia Pvt. Ltd., Singapore, 2002.
2. Balagurusamy, E., "Numerical Methods", Tata McGraw-Hill Pub.Co.Ltd, New Delhi, 1999.

22153C22P- OPTIMISATIONTECHNIQUES

3003
SEMESTER II

AIM:
Tounderstandthearchitectureofdifferent optimizationtechniquesanditsapplications

OBJECTIVES:
To provide aclearunderstandingof

- Tointroducethebasicconceptsoflinear programming
- ToeducateontheadvancementsinLinearprogrammingtechniques
- Tointroducenon-linearprogrammingtechniques
- Tointroducetheinteriorpointmethodsofsolvingproblems
- Tointroducethedynamicprogramming method

UNITI LINEARPROGRAMMING 9
Introduction-formulationoflinearprogrammingmodel-Graphicalsolution–solvingLPP using simplex algorithm – Revised Simplex Method

UNITIIADVANCESIN LPP 9
Dualittheory-Dualsimplexmethod-Sensitivityanalysis–-Transportationproblems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis..

UNITIII NONLINEARPROGRAMMING 9
Classification of Non Linear programming – Lagrange multiplier method – Karush – KuhnTuckerconditions–Reducedgradientalgorithms–Quadraticprogrammingmethod– Penalty and Barrier method.

UNITIVINTERIORPOINT METHODS 9
Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm.

UNITVDYNAMICPROGRAMMING 9
Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–BackwardandForwardrecursion–Computationalprocedure–Conversionoffinalvalue problem in to Initial value problem.

TOTAL:45PERIODS

COURSEOUTCOMES

- Tounderstandethicalissues,environmentalimpact andacquire management skills.

TEXT BOOKS:

1. HillierandLieberman"IntroductiontoOperationsResearch",TMH,2000.
2. R.Panneerselvam,"OperationsResearch",PHI,2006.
3. HamdyATaha,"OperationsResearch–AnIntroduction",PrenticeHallIndia, 2003.

REFERENCES:

1. Philips,RavindranandSolberg,"OperationsResearch",JohnWiley, 2002.
2. RonaldL.Rardin, "OptimizationinOperationResearch"PearsonEducationPvt.Ltd. New Delhi, 2005.

SemesterII

22153C23P-ELECTRICAL MACHINES-II

3104

AIM:

To expose the students to theconceptsofsynchronousandasynchronousmachinesand analyzetheirperformance.

OBJECTIVES:

Toimpartknowledgeon

i. Constructionandperformanceof salientandnon –salienttypesynchronous generators.
ii. Principleofoperationandperformanceofsynchronousmotor.
iii. Construction,principleofoperationandperformanceofinduction machines.
iv. Startingandspeedcontrolofthree-phaseinductionmotors.
v. Construction, principle of operation and performance of single phase induction motors and special machines.

UNITI:SYNCHRONOUSGENERATOR 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 - Capabilitycurves.

UNITII:SYNCHRONOUSMOTOR 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.

UNITIII:THREEPHASEINDUCTIONMOTOR 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

UNITIV:STARTINGANDSPEEDCONTROLOFTHREEPHASEINDUCTION 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 SPECIALMACHINE 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

COURSEOUTCOMES

AbilitytounderstandtheconstructionandworkingprincipleofSynchronous Generator

- AbilitytounderstandMMFcurvesandarmaturewindings.
- AbilitytoacquireknowledgeonSynchronousmotor.
- AbilitytounderstandtheconstructionandworkingprincipleofThreephase Induction Motor
- AbilitytounderstandtheconstructionandworkingprincipleofSpecialMachines
- AbilitytopredeterminetheperformancecharacteristicsofSynchronousMachines.

TEXTBOOKS

1. D.P.KothariandI.J.Nagrath,'ElectricMachines',TataMcGrawHillPublishing 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, 'Theoryand Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3. K.MurugeshKumar,'ElectricMachines',VikaspublishinghousePvtLtd,2002.
4. Sheila.C.Haran,'Synchronous,InductionandSpecialMachines',ScitechPublications, 2001.

Semester II

22153C24P-DIGITAL ELECTRONICS

3104

AIM:

TointroducethefundamentalsofDigitalCircuits,combinationalandsequentialcircuit.

OBJECTIVES:

i. Tostudyvariousnumbersystemsandtosimplifythemathematicalexpressionsusing Boolean functions simple problems.
ii. Tostudyimplementationofcombinationalcircuits
iii. Tostudythedesignofvarioussynchronousandasynchronous circuits.
iv. Toexposethestudentstovariousmemorydevices.

UNITI NUMBERSYSTEMS

12

Review of Binary, Octal and Hexa-decimal number systems – Conversions, Binary Arithmeticmagnitudeform –1's,2'scomplementrepresentation,Codes: -BCD,Excess– 3, Graycode, ASCII codes, Error detecting codes (Hamming code)

UNITII BOOLEANALGEBRA

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)

UNITIII CombinationalLogic

12

Design of Logic gates- Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates &multiplexers.

UNITIV SequentialLogicDesign **12**

BuildingblocksofSequentiallogic–RS,JK,Master–Slave,DandTflip-flop, Asynchronousandsynchronouscounters–BinaryandBCDcounters–shift registers – Design and Implementation of Sequential synchronous circuits

UNITV LogicFamilies **12**

Memories:ROM, PROM,EPROM,PLA,PLD,FPGA, digitallogicfamilies: TTL,ECL,

CMOS.

TOTAL=60Hrs

COURSEOUTCOMES

- AbilitytodesigncombinationalandsequentialCircuits.
- Abilitytosimulateusingsoftwarepackage.
- Abilitytostudyvariousnumbersystemsandsimplifythelogicalexpressions using
- Booleanfunctions
- Abilitytodesignvarioussynchronousandasynchronouscircuits.
- AbilitytointroduceasynchronoussequentialcircuitsandPLDs
- Abilitytointroducedigitalsimulationfordevelopmentofapplicationoriented logic circuits.

TEXT BOOK:

1. AlbertPaul,MalvinoandDonald.P.Leach,“DigitalPrinciplesandApplications”, McGraw Hill Publications.
2. Floyd,“DigitalFundamentals”,UniversalBookStall,NewDelhi,1993.
3. MorisMano,“DigitalElectronicsandDesign“,PrenticeHallofIndia,2000.

REFERENCE:

1. “DigitalLogic&ComputerDesign”, PrenticeHallofIndia,2000.

22153C25P-TRANSMISSIONANDDISTRIBUTION 4004

SemesterII

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. Todevelopexpressionforcomputationoffundamentalparametersoflines.
ii. Tocategorizethe lines into different classes anddevelop equivalent circuits forthese classes.
iii. Toanalyzethevoltagedistributionininsulatorstringsandcablesandmethodsto improve the same.

UNITI:INTRODUCTION 12

Structureofelectricpowersystem:Variouslevelssuchasgeneration,transmissionand 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:TRANSMISSIONLINEPARAMETERS 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.

UNITIII:MODELLINGANDPERFORMANCEOFTRANSMISSIONLINES 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 andvoltage stabilityconsiderations; shunt and series compensation; Ferranti effect and corona loss.

UNITIV:INSULATORS ANDCABLES 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.

UNITV:DESIGN OFTRANSMISSIONLINES 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

COURSEOUTCOMES

Tounderstandtheimportanceandthefunctioningoftransmissionlineparameters.

- Tounderstandtheconceptsof Linesand Insulators.
- Toacquireknowledgeontheperformanceof Transmissionlines.
- ToacquireknowledgeonUndergroundCabilitys

TEXTBOOKS

1. B.R.Gupta,'PowerSystemAnalysisandDesign',S.Chand,NewDelhi,2003.
2. S.N.Singh,'ElectricPowerGeneration,TransmissionandDistribution',Prentice Hall of India Pvt. Ltd, New Delhi, 2002.

REFERENCEBOOKS

1. Luces M.Fualkenberry,Walter Coffer, 'Electrical PowerDistribution and Transmission', Pearson Education, 1996.
2. HadiSaadat,'PowerSystemAnalysis,'TataMcGrawHillPublishingCompany', 2003.
3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi.
4. 'TamilNaduElectricityBoardHandbook', 2003.

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22148S31CP-PROBABILITYANDSTATISTICS 3104

(CommontoMech,Civil,EEE)

SEMESTER-III

UNITI PROBABILITYANDRANDOMVARIABLE 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.

UNITII TWODIMENSIONALRANDOMVARIABLES 9+3hrs

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

UNITIII STANDARDDISTRIBUTIONS 9+3hrs

Binomial, Poisson, Geometric, Negative Binomial, Uniform, Exponential, Gamma, WeibullandNormaldistributionsandtheirproperties-Functionsofarandomvariable.

UNITIV TESTINGOFHYPOTHESIS 9+3hrs

Sampling distributions – Testing of hypothesis for mean, variance, proportions anddifferences using Normal, t, Chi-square and F distributions - Tests for independence ofattributes and Goodness of fit.

UNITV DESIGN OFEXPERIMENTS 9+3hrs

Analysisof variance–One way classification –Completerandomizeddesign -Two–way classification –Randomized block design - Latin square.

Note:Useofapprovedstatisticaltablepermittedin **Totalnoofhrs:60hrs**

COURSEOUTCOMES

- Eigenvaluesandeigenvectors,diagonalizationofamatrix,Symmetric matrices, Positive definite matrices and similar matrices.
- Gradient,divergenceandcurlofavectorpoint functionandrelatedidentities.
- Evaluationofline,surfaceandvolumeintegralsusingGauss,Stokesand

Green'stheoremsandtheirverification.

- Analyticfunctions,conformalmappingandcomplexintegration.
- Laplace transform and inverse transform of simple functions, properties, variousrelatedtheoremsandapplicationtodifferentialequationswithconstant coefficients

TEXTBOOKS

1. Ross.S.,"AfirstCourseinProbability",FifthEdition,PearsonEducation,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)

REFERENCESBOOKS

1) Walpole,R.E.,Myers,R.H.MyersR.S.L.andYe.K,"ProbabilityandStatisticsfor Engineers and Scientists", Seventh Edition, Pearsons Education, Delhi, 2002.
2) Lipschutz.SandSchiller.J,"Schaum'soutlines-IntroductiontoProbabilityand Statistics", McGraw-Hill, New Delhi, 1998.
3) Gupta,S.C, andKapur, J.N., "FundamentalsofMathematicalStatistics", Sultan Chand, Ninth Edition , New Delhi ,1996.

SemesterIII

22153C32P-LINEARINTEGRATEDCIRCUITSAND APPLICATIONS 3104

AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

OBJECTIVES

- TostudytheICfabrication procedure.
- Tostudycharacteristics;realizecircuits;designforsignalanalysisusing
- TostudytheapplicationsofOp-amp.
- To studyinternal functional blocks and the applications ofspecial ICs like circuits, regulator Circuits, ADCs.

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 and FETs.

UNITII:CHARACTERISTICSOFOPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics,, differential amplifier; frequency response ofOP-AMP; Basicapplications of op-amp – Inverting and Non-inverting Amplifiers-V/I & I/V converters ,summer, differentiatorand integrator.

UNITIII:APPLICATIONSOFOPAMP 9

Instrumentation amplifier, Log and Antilog Amplifiers, first and second order active filters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R- 2R ladder and weighted resistor types), A/D converters using opamps.

UNITIV:SPECIALICs 9

Functionalblock,characteristics&applicationcircuitswith555TimerIc-566voltage controlled oscillator Ic; 565-phase lock loop Ic ,Analog multiplier ICs.

UNITV:APPLICATIONICs 9

IC voltage regulators –LM78XX,79XX Fixed voltage regulators - LM317, 723 Variable voltage regulators, switching regulator- SMPS- LM 380 power amplifier- ICL 8038 function generator IC.

TOTAL=45

COURSEOUTCOMES

- Abilitytounderstandandanalyse,linearanddigitalelectronic circuits.

TEXT BOOKS

1. DavidA.Bell,'Op-amp&LinearICs',Oxford,2013.
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age,2003.
3. RamakantA.Gayakward,'Op-ampsandLinearIntegratedCircuits',IVedition, Pearson Education, 2003 / PHI. 2000.

REFERENCEBOOKS

1. Fiore,"Opamps&LinearIntegratedCircuitsConcepts&Applications",Cengage,2010.
2. Floyd,Buchla,"FundamentalsofAnalogCircuits,Pearson, 2013.
3. JacobMillman,ChristosC.Halkias,'IntegratedElectronics-AnalogandDigital circuits system',Tata McGraw Hill, 2003.
4. Robert F.Coughlin, Fredrick F. Driscoll, 'Op-amp and Linear ICs', PHI Learning, 6th edition,2012.

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SEMESTER-III

22153C33P-POWERELECTRONICS 4 004

AIM:
Tounderstandthevariousapplicationsofelectronicdevicesforconversion,controland conditioning of the electrical power.

OBJECTIVES:
- Togetanoverviewofdifferenttypesofpowersemiconductordevicesandtheir switching characteristics.
- Tounderstandtheoperation,characteristicsandperformanceparametersof controlled rectifiers
- Tostudytheoperation,switchingtechniquesandbasicstopologiesofDC-DC switching regulators.
- Tolearnthedifferent modulationtechniquesofpulsewidthmodulatedinvertersand to understand harmonic reduction methods.
- To studythe operation ofAC voltage controller and Matrixconverters.

UNITI-POWERSEMI-CONDUCTORDEVICES: 12
Overviewofswitchingdevices–Driverandsnubbercircuit ofSCRTRIAC,GTO,GBT, MOSFET – Computer simulation of PE circuits.

UNITII-PHASECONTROLLEDCONVERTERS 12
2 pulse / 3 pulse and 6 pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters.

UNITIII-DCTO DC CONVERTERS 12
Stepdownandstepupchopper –Forcedcommutationtechniques–Timeratio controland current limit control – Switching mode regulators Buck, Boost, Buck-Boost – concept of resonant switching.

UNITIV- INVERTERS 12
Singlephaseandthreephase[120&180mode]inverters –PWMtechniques –Sinusoidal PWM, Modified sinusoidal PWM and multiple PWM – Voltage and harmonic control–Seriesresonantinverter–currentsourceinverter.

UNITV-ACTOACCONVERTERS

Single phase AC voltage controllers – Multistage sequence control – single phase andthree phase cycloconverters – power factor control – Matrix converters.

L:45T: 15TOTAL:60 PERIODS

COURSEOUTCOMES

- AbilitytoanalyseAC-ACandDC-DCandDC-ACconverters.
- Abilitytochoosetheconvertersforrealtimeapplications.

TEXTBOOKS:

1. RashidM.H.,"PowerElectronicsCircuits,DevicesandApplications",PrenticeHall India, 3rd Edition, New Delhi, 2004.
2. NedMohan,T.M.Undeland,W.P.Robbins,"PowerElectronics:Converters, applications and design", John wiley and Sons, 3rd Edition, 2006.

REFERENCES:

1. Cyril.W.Lander,"PowerElectronics",McGrawHillInternational,ThirdEdition,1993.
2. P.S.Bimbra"PowerElectronics",KhannaPublishers,thirdEdition2003.
3. PhilipT.Krein,"ElementsofPowerElectronics"OxfordUniversityPress,2004 Edition.

22153C34P-MEASUREMENTSANDINSTRUMENTATION

400 4

SemesterIII

AIM

Toprovideadequateknowledge inelectricalinstrumentsandmeasurementstechniques.

OBJECTIVES

Tomakethestudenthaveaclearknowledgeofthebasiclawsgoverningtheoperationof the instruments, relevant circuits and their working.

i. Introductiontogeneralinstrument system,error,calibrationetc.
ii. Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
iii. Tohaveanadequateknowledgeofcomparisonmethodsofmeasurement.
iv. Elaboratediscussionaboutstorage&displaydevices.
v. Exposuretovarioustransducersanddataacquisitionsystem.

UNITI:INTRODUCTION 10

Functional elementsof an Instrument-Static and Dynamiccharacteristics -Errorsin measurement-Statisticalevaluationofmeasurementdata-StandardandCalibration.

UNITII: ELECTRICAL ANDELECTRONICSINSTRUMENTS 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.

UNITIII:SIGNAL CONDITIONINGCIRCUITS 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.

UNITIV:STORAGEAND DISPLAYDEVICES 12

Magnetic disc and Tape Recorders -Digital plotters and printers -CRT displays - DigitalCRO – LED, LCD and Dot matrix displays.

UNITV: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

COURSEOUTCOMES

ToacquireknowledgeonBasicfunctionalelementsofinstrumentation

- TounderstandtheconceptsofFundamentalsofelectricalandelectronic instruments
- Abilitytocomparebetweenvariousmeasurementtechniques
- ToacquireknowledgeonVariousstorageanddisplaydevices
- TounderstandtheconceptsVarioustransducersandthedataacquisitionsystems
- AbilitytomodelandanalyzeelectricalandelectronicInstrumentsandunderstand the operational features of display Devices and Data Acquisition System.

TEXT BOOKS

1. E.O.Doebelin, 'Measurement Systems – Applicationand Design', Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, 'A Course in Electrical & Electronic Measurements &Instrumentation', Dhanpat Rai and Co, 2004.

REFERENCEBOOKS

1. A.J.Bouwens,'DigitalInstrumentation',TataMcGrawHill,1997.
2. D.V.S. Moorthy, 'Transducers andInstrumentation', Prentice Hall of India PvtLtd, 2003.
3. H.S.Kalsi,'ElectronicInstrumentation',TataMcGrawHill,1995.
4. MartinReissland,'ElectricalMeasurements',NewAgeInternational(P)Ltd.,Delhi,2001.
5. J.B.Gupta,'ACourseinElectronicandElectricalMeasurements',S.K.Kataria&Sons, Delhi, 2003.

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22153L35P-DCANDACELECTRICALMACHINES LABORATORY 0 03 2

SemesterIII

OBJECTIVES:

- To impart hands on experience in verification of circuit laws and theorems, measurement of circuit parameters, study of circuit characteristics and simulation of time response.
- Toexposethestudentstothebasicoperationofelectricalmachinesandhelpthem to develop experimental skills.

LISTOFEXPERIMENTS

1. OpencircuitcharacteristicsofD.C.shuntgenerator.
2. LoadcharacteristicsofD.C.shuntgenerator.
3. Loadtest onD.C. shuntand Compound Motor.
4. LoadtestonD.C.seriesmotor.
5. Swinburne'stestandspeedcontrolofD.C.shuntmotor
6. Hopkinson'stestonD.C.motorgenerationset.
7. Loadtestonsinglephaseandthreephasetransformer
8. opencircuit andshortcircuit testsonsinglephaseandthreephasetransformer (Determination of equivalent circuit parameters).
9. Loadtestonsinglephaseinduction motor.
10. Noloadandblockedrotortestsonthreephaseinductionmotor(Determinationof equivalent circuit parameters)
11. LoadtestonThreephaseinduction motor.
12. StudyofStarters **TOTAL: 45**

<u>COURSEOUTCOMES</u>

Attheend ofthe course,thestudentshould havethe:

- AbilitytoconductperformancetestsonDCandACmachines
- AbilitytounderstandandanalyzeEMFandMMF methods
- AbilitytoanalyzethecharacteristicsofVand InvertedVcurves
- AbilitytounderstandtheimportanceofSynchronousmachines
- AbilitytounderstandtheimportanceofInductionMachines

LISTOFEQUIPMENTFORABATCHOF30STUDENTS:

1. DCShuntMotorwithLoadingArrangement–3nos
2. SinglePhaseTransformer–4 nos
3. DCSeriesMotorwithLoadingArrangement–1No.

4. ThreePhaseInductionMotorwithLoadingArrangement–2nos
5. SinglePhaseInductionMotorwithLoadingArrangement–1No
6. DCShuntMotorCoupledWithDCCompoundGenerator–2nos
7. DCShuntMotorCoupledWithDCShuntGenerator–1No.
8. Tachometer-Digital/Analog –8nos
9. SinglePhaseAutoTransformer–2nos
10. ThreePhaseAutoTransformer–1No.
11. SinglePhaseResistiveLoadingBank–2nos
12. ThreePhaseResistiveLoadingBank.–2nos
13. SPSTswitch–2 nos
14. SinglePhaseTransformer -1No.
15. ThreePhaseTransformer-1 No.

SEMESTER-IV

22153C41P-PROTECTION ANDSWITCHGEAR

4 0 0 4

AIM

Toexposethestudentstothevariousfaultsinpowersystemand learnthevarious methods of protection scheme.
TounderstandthecurrentinterruptioninPowerSystemandstudythevarious switchgears.

OBJECTIVES

i. Discussion on various earthling practices usage of symmetrical components to estimate fault current and fault MVA.
ii. StudyofRelays&Studyofprotectionscheme,solidstaterelays.
iii. Tounderstandinstrumenttransformerandaccuracy.
iv. Tounderstand themethod ofcircuit breaking variousarctheoriesArcing phenomena – capacitive and inductive breaking.
v. Typesofcircuit breakers.

UNITI:INTRODUCTION 12

Principlesandneedforprotectiveschemes–natureandcausesoffaults–typesoffaults – fault current calculation using symmetrical components – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme.

UNITII:OPERATINGPRINCIPLESANDRELAYCONSTRUCTIONS 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

UNITIII:APPARATUS PROTECTION 12

Apparatusprotectiontransformer,generator,motor,protectionofbusbars,transmission lines – CTs and PTs and their applications in protection schemes.

UNITIV: THEORY OFCIRCUIT INTERRUPTION 12

Physicsofarcphenomenaandarc interruption.Restricting voltage&Recoveryvoltage, rate of rise of recovery voltage, resistance switching, current chopping, and interruption of capacitive current – DC circuit breaking.

UNITV: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

COURSEOUTCOMES

- AbilitytounderstandandanalyzeElectromagneticandStaticRelays.
- Abilitytosuggestsuitabilitycircuitbreaker.
- Abilitytofindthecausesofabnormaloperatingconditionsoftheapparatusand system.
- Abilitytoanalyzethecharacteristicsandfunctionsofrelaysand protection schemes. Ability to study about the apparatus protection, static and numerical relays.
- Abilitytoacquireknowledgeonfunctioningofcircuitbreaker.

TEXT BOOKS

1. B.Ravindranath,andN.Chander,'PowerSystemProtection&Switchgear',Wiley Eastern Ltd., 1977.

REFERENCEBOOKS

1. SunilS.Rao,'SwitchgearandProtection',Khannapublishers,NewDelhi,1986.
2. C.L.Wadhwa, 'ElectricalPowerSystems',NewageInternational(P)Ltd.,2000.
3. M.L.Soni,P.V.Gupta,V.S.Bhatnagar,A.Chakrabarti,'ATextBookonPower System Engineering', Dhanpat Rai & Co., 1998.
4. BadriRam,Vishwakarma,'PowerSystemProtectionandSwitchgear',TataMcGraw hill, 2001.
5. Y.G.Paithankar andS.R. Bhide,'FundamentalsofPowerSystemProtection', Prentice Hall of India Pvt. Ltd., New Delhi – 110001, 2003.

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22153C42P-HIGHVOLTAGEDCTRANSMISSION

3104

SemesterIV

AIM:
TolearntheHVDCmodellingandcontrolstrategy.

OBJECTIVES:
Tostudytheperformanceofconvertersand modelingofDClinewithcontrollers. To study about converter harmonics and its mitigation using active and passive filters.

UNITI-DCPOWER TRANSMISSIONTECHNOLOGY 9
Introduction-comparison of AC and DC transmission application of DC transmission – DescriptionofDCtransmissionsystemplanningforHVDCtransmission-moderntrends In DC transmission.

UNITII-ANALYSISOFHVDC 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.

UNITIII-CONVERTERAND HVDCSYSTEMCONTROL 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.

UNITIV-HARMONICSAND FILTERS 9
Introduction-generation of harmonics-design of AC filters-DC filters-carrier frequency and RI noise.

UNITV-SIMULATIONOFHVDCSYSTEMS 9
Introduction-system simulation: Philosophy and tools-HVDC system simulation-modeling of HVDC systems for digital dynamic simulation.

TOTAL:45PERIODS

<u>COURSEOUTCOMES</u>

- AbilitytounderstandGenerationandmeasurementofhighvoltage.
- AbilitytounderstandHighvoltagetesting.
- Ability to understand various types of over voltagesinpowersystem.Abilitytomeasure over voltages.
- Abilitytotestpowerapparatusandinsulationcoordination

TEXTBOOKS:

1. Padiyar,K.R.,HVDCpowertransmissionsystem,WileyEasternLimited,New Delhi 1990.First edition.
2. P.Kundur,'PowerSystemStabilityandControl',TataMcGrawHillPublishing Company Ltd., USA, 1994.
3. Arrillaga,J.,HighVoltagedirectcurrenttransmission,PeterPregrinus,London, 1983.

REFERENCES:

1. EdwardWilsonKimbark,DirectCurrentTransmission,Vol.I,Wileyinterscience, New York, London, Sydney, 1971.
2. RakoshDasBegamudre,ExtrahighvoltageACtransmissionengineering New

22153C43P- SOLIDSTATEDRIVES

3104

SemesterIV

AIM

Tostudyandunderstandtheoperationofelectricdrivescontrolledfroma power electronic converter and to introduce the design concepts of controllers.

OBJECTIVES

i. To understandthestablesteady-state operationand transientdynamics of amotor- load system.
ii. Tostudyandanalyzetheoperationoftheconverter/chopperfeddcdriveandto solve simple problems.
iii. To studyand understand the operation of both classical and modern induction motor drives.
iv. To understandthe differences between synchronous motor driveand induction motor drive and to learn the basics of permanent magnet synchronous motor drives.
v. Toanalyzeanddesignthecurrentandspeedcontrollersforaclosedloopsolid-state d.cmotordrive.

UNITIDRIVECHARACTERISTICS

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**.**

UNITII DCMOTOR DRIVE

9

Steady state analysis of the single and three phase fully controlled converterfed 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.

UNITIIISTATORCONTROLLEDINDUCTIONMOTORDRIVES

9

Variableterminalvoltagecontrol –Variable frequencycontrol – V/fcontrol -ACvoltage controllers – Four-quadrant control and closed loop operation - Frequency controlled drives- VSI and CSI fed drives – closed loop control.

UNITIVROTORCONTROLLEDINDUCTIONMOTOR DRIVES

9

Rotorresistancecontrol–slippowerrecoveryschemes-subsynchronousandsuper synchronous operations – closed loop control – Braking in induction motors.

UNITV-SYNCHRONOUSMOTORDRIVES **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

COURSEOUTCOMES

- Abilitytounderstandandsuggestaconverterforsolidstatedrive.
- Abilitytoselectsuitabilitydriveforthegivenapplication.
- Ability tostudyaboutthesteadystateoperationandtransientdynamicsof a motor load system. Ability to analyze the operation of the converter/chopper fed dc drive.
- Abilitytoanalyzetheoperationandperformanceof ACmotordrives.
- Abilitytoanalyzeanddesignthecurrentandspeedcontrollersforaclosedloop solid

TEXT BOOKS

1. R. Krishnan, 'Electric Motor & Drives: Modelling, Analysis and Control', Prentice Hall of India, 2001.
2. BimalK.Bose.'ModernPowerElectronicsandACDrives',PearsonEducation, 2002.

REFERENCEBOOKS

1. G.K.Dubey,'PowerSemi-conductorControlledDrives',PrenticeHallofIndia,1989.
2. VedamSubrahmanyam, "Electricdrives concepts and applications", TMH Pub. Co.Ltd., 1994.
3. Murphy,J.M.DandTurnbull.F.G.,"ThyristorcontrolofACMotors",Pergamon Press, 1988.
4. Sen.P.C.,"ThyristorD.C.Drives",JohnWileyandSons, 1981.

22153L45PCONTROLAND INSTRUMENTATIONLABORATORY

0032

SemesterIV

AIM

Toprovideknowledgeonanalysisand designofcontrolandinstrumentation

LISTOFEXPERIMENTS

CONTROLSYSTEMS:

1. P,PIandPIDcontrollers
2. StabilityAnalysis
3. ModelingofSystems– Machines,SensorsandTransducers
4. DesignofLag,LeadandLag-LeadCompensators
5. PositionControlSystems
6. Synchro-Transmitter-ReceiverandCharacteristics
7. SimulationofControlSystemsbyMathematical developmenttools.

INSTRUMENTATION:

8. Bridge Networks–ACandDCBridges
9. DynamicsofSensors/Transducers

a. Temperature
b. Pressure
c. Displacement
d. Optical
e. Strainf.Flow

10. PowerandEnergyMeasurement
11. SignalConditioning

a. InstrumentationAmplifier
b. Analog–Digital andDigital–Analogconverters(ADCandDACs)

12. ProcessSimulation. **P=45**

Total=45

COURSEOUTCOMES

Abilitytounderstandandapplybasicscience,circuittheory,Electro-magneticfieldtheory control theoryand apply them to electrical engineering problems.

LISTOFEQUIPMENTFORABATCHOF30STUDENTS:

CONTROLSYSTEMS:

1. PIDkit–1No.

DSO–1 No.

CROProbe–2nos

Personalcomputers

3. DCmotor–1No.

Generator–1No.Rheostats–2nos Ammeters

Voltmeters

Connectingwires(3/20)

4. CRO30MHz–1No.

2MHzFunctionGenerator–1No.

5. PositionControlSystemsKit(withmanual)–1No.,TachoGeneratorCouplingset

6. ACSynchrotransmitter&receiver–1No.

Digital multi meters

INSTRUMENTATION:

7. R,L,CBridgekit(withmanual)

8. a)Electricheater–1No.

Thermometer–1No.Thermistor(silicontype)RTDnickeltype–1No.

b) 30psiPressurechamber(completeset)–1No.Currentgenerator(0–20mA) Air foot pump – 1 No. (with necessary connecting tubes)

c) LVDT20mmcorelengthmovabletype–1No.CRO30MHz–1No.

d) Opticalsensor–1No.Light source

e) StrainGaugeKitwithHandyleverbeam–1No.

100gm weights – 10 nos

f) FlowmeasurementTrainerkit–1No.

(1/2HPMotor,Watertank,DigitalMilliammeter,completeset)

9. Single phase Auto transformer – 1No.

Watthourmeter(energymeter)–1No.Ammeter

Voltmeter Rheostat Stop watch

Connectingwires(3/20)

10. ICTransistorkit–1No.

22153C51P-POWERSYSTEMANALYSIS

3104
SemesterV

AIM
Tobecomefamiliarwithdifferentaspectsofmodelingofcomponentsandsystemand different methods of analysis of power system planning and operation.

OBJECTIVES
i. Tomodelsteady-stateoperationoflarge-scalepowersystemsandtosolvethepower flow problems using efficient numerical methods suitable for computer simulation.
ii. Tomodelandanalysepowersystemsunderabnormal(fault)conditions.
iii. Tomodelandanalysethedynamicsofpowersystemforsmall-signalandlarge signal disturbances and o design the systems for enhancing stability.

UNITI-THEPOWERSYSTEMANOVERVIEW ANDMODELLING 12

ModernPowerSystem-BasicComponentsofapowersystem-PerPhaseAnalysis Generatormodel- Transformer model- line model. Theper unit system-Change ofbase.

UNITII-POWERFLOW 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.

UNITIII-FAULTANALYSIS-BALANCEDFAULT 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 – sequencenetworks–singlelinetogroundfault– linefault-Doublelinetogroundfault– Unbalanced fault analysis using bus impedance matrix.

UNITV-POWERSYSTEMSTABILITY 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
COURSEOUTCOMES

- Abilityto model the power system under steady state operating condition

  Abilitytounderstandandapplyiterativetechniquesforpowerflowanalysis

  Abilityto model and carryout short circuit studies on power system

- Abilitytomodelandanalyzestabilityproblemsinpowersystem

- AbilitytoacquireknowledgeonFaultanalysis.
- Abilitytomodelandunderstandvariouspowersystemcomponentsandcarryout power flow, short circuit and stability studies

TEXT BOOKS:

1. Hadi Saadat “Power system analysis”, Tata McGraw Hill Publishing Company, New Delhi, 2002 (Unit I, II, III, IV)
2. P.Kundur, “Power SystemStabilityand Control”, TataMcGraw Hill Publishing Company, New Delhi, 1994 (Unit V)

REFERENCEBOOKS:

1. I.J.NagrathandD.P.Kothari,‘ModernPowerSystemAnalysis’,TataMcGraw-Hill publishing company, New Delhi, 1990.
2. M.A.Pai,‘ComputerTechniquesinpowersystemAnalysis’,TataMcGraw–Hill publishing company, New Delhi, 2003.
3. John J.Graingerand Stevenson Jr.W.D., ‘PowerSystem Analysis’,McGraw Hill International Edition, 1994

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22153C52P-POWERQUALITY **3104**

Semester V

UNITI INTRODUCTIONTO 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.

UNITII VOLTAGESAGS 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.

UNITIII 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.

UNITIV 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.

UNITV POWER QUALITYMONITORING 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

COURSEOUTCOMES

- Abilitytounderstandandanalyzepowersystemoperation,stability,controland protection.
- Thestudentsableto understandtheovervoltageprotection&analysistoolsused for analyzing the transients.
- Theyare fullytrained in designing and evaluating the devices ofharmonic distortion.

REFERENCEBOOKS

1. Roger.C.Dugan,Mark.F.McGranagham,SuryaSantoso,H.WayneBeaty,'Electrical Power Systems Quality' McGraw Hill, 2003.
2. PSCADUserManual.

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22153C53P-SPECIAL ELECTRICALMACHINES 4004

Semester V

AIM

Toexposethestudentstotheconstruction,principleofoperationandperformanceof special electrical machines as an extension to the studyof basic electrical machines.

OBJECTIVES

Toimpartknowledgeon

i. Construction,principleofoperationandperformanceofsynchronousreluctance motors.
ii. Construction,principleofoperationandperformanceofsteppingmotors.
iii. Construction,principleofoperationandperformanceofswitchedreluctancemotors.
iv. Construction,principleofoperationandperformanceofpermanentmagnetbrushless D.C. motors.
v. Construction,principleofoperationandperformanceofpermanentmagnet synchronous motors.

UNITI-SYNCHRONOUSRELUCTANCEMOTORS 9

Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.

UNITII-STEPPINGMOTORS 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.

UNITIII-SWITCHEDRELUCTANCEMOTORS 9

Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control- characteristics – computer control.

UNITIV-PERMANENTMAGNET BRUSHLESSD.C. MOTORS 9

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

UNITV-PERMANENTMAGNETSYNCHRONOUSMOTORS 9

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.

L=45Total=45

COURSEOUTCOMES

- AbilitytoanalyzeanddesigncontrollersforspecialElectricalMachines.
  - Abilitytoacquiretheknowledgeonconstructionand operationofsteppermotor.
  - Abilitytoacquiretheknowledgeonconstructionandoperationofstepper switched reluctance motors.
  - Abilitytoconstruction,principleofoperation,switchedreluctance motors.

- Abilitytoacquiretheknowledgeonconstructionandoperationofpermanent magnet brushless D.C. motors.
- Abilitytoacquiretheknowledgeonconstructionandoperationofpermanent magnet synchronous motors.

TEXT BOOKS

1. Miller,T.J.E.,‘BrushlessPermanentMagnetandReluctanceMotorDrives’,Clarendon Press, Oxford, 2289.
2. Aearnley,P.P.,‘SteppingMotors–AGuidetoMotorTheoryandPractice’,Peter Perengrinus, London, 1982.

REFERENCES

1. Kenjo,T.,‘SteppingMotorsandtheirMicroprocessorControls’,ClarendonPress London, 1984.
2. Kenjo, T., and Nagamori, S., ‘Permanent Magnet and Brushless DC Motors’,Clarendon Press, London, 1988.

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22153L55P-POWERELECTRONICSANDDRIVESLAB

SemesterV

0032

AIM

Tostudythecharacteristicsofswitchingdevicesanditsapplicationsinrectifier inverter,chopper and resonant converter.

1. StudyOfV-ICharacteristicsOfAnSCR.
2. StudyOfV-ICharacteristicsOfATRIAC.
3. StudyOfDifferentTrigerringCircuitsFor Thyristor.
4. StudyOfUni-JunctionTransistor(UJT)TrigerringCircuit.
5. StudyOfAFiringCircuit SuitableForSinglePhaseHalfControlledConvertor.
6. SimulationOntheSinglePhaseAc-DcUncontrolledConvertorwith&without the source Inductance.
7. SimulationOfASinglePhaseAcToControlledDcConvertorwith&withoutthe source Inductance.
8. SinglePhaseHalfControlledBridgeConvertorWithTwoThyristors&Two Diodes.
9. SinglePhaseFullyControlledBridgeConvertor UsingFourThyristors.
10. PspiceorMATHLAB SimulationOfDcto DcStep DownChopper.
11. PspiceorMATHLABSimulationOfSinglePhaseController withR-LLoad.
12. PspiceorMATHLABSimulationOfPWMBridgeInvertorOfR-LLoad Using MOSFET.

COURSEOUTCOMES

- Abilityto practice and understand converter and inverter circuits and apply software for engineering problems.
- AbilitytoanalyzeaboutACtoDCconverter circuits.
- AbilitytoanalyzeaboutDCtoACcircuits.
- AbilitytoacquireknowledgeonACto ACconverters
- Abilitytoacquireknowledgeonsimulationsoftware.

22153C61P-UTILIZATIONOFELECTRICALENERGY

3104
SemesterVI

AIM
Toplananddesignusingbasicprinciplesandhandbooks
Toselectequipment,processesandcomponentsindifferentsituations.

OBJECTIVES

i. Toensurethattheknowledgeacquiredisappliedinvariousfieldsasperhisjob 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.

UNITII ELECTRIC HEATING 12
Resistance heating – Induction heating – Dielectric heating – Arc furnace – Control equipment, efficiency, and losses – Energyconservation in Arc Furnace Industry.

UNITIII ELECTRIC WELDING 12
Weldingequipment– Characteristicsofcarbonandmetallicarcwelding – Buttwelding– Spot welding – Energy conservation in welding.

UNITIV ELECTRICVEHICLE 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

UNITV ELECTROCHEMICAL PROCESS 12
Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, efficiency – Batteries – Types – Charging methods.

Total= 60

COURSEOUTCOMES

- Tounderstandthemainaspectsofgeneration,utilizationandconservation.
- Toidentifyanappropriatemethodofheatingforanyparticularindustrial application.
- Toevaluatedomesticwiringconnectionanddebuganyfaultsoccurred.
- To construct an electric connection for any domestic appliance like refrigeratoraswellastodesignabatterychargingcircuitforaspecific household application.

TextBooks:

1. Tripathy,S.C.,“ElectricEnergyUtilization&Conservation”–TataMcGrawHill Publishing Company.
2. Uppal,S.L.,“ElectricPower”,KhannaPublishers.
3. Soni,M.L.,P.V.Gupta&Bhatnagar,“A courseinElectricPower”,DhanpatRai&Sons.

Reference Books:

1. Partab,H.,“Art&ScienceUtilizationofElectricalEnergy”–DhanpatRai&Sons.
2. Wadhwa,C.L.,“Generation,Utilization&Distribution”-WilseyEastern Ltd.
3. WadhaCL- UtilizationofElectricPower;NewAgeInternational
4. Suryanarayana.N.V.,“UtilizationofElectricPower”- WilseyEasternLtd.

22153C62PSOLIDSTATE RELAYS 4004

Semester VI

UNIT1 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.

UNIT2 9

Static Relay Circuits (Using Analog and Digital IC's) for Over Current, Inverse Time Characteristics, Differential Relay and Directional Relay.

UNIT3 9

Static Relay Circuits for Generator Loss of Field, Under Frequency Distance Relays, Impedance, Reactance, MHO, Reverse Power Relays.

UNIT4 9

Static Relay Circuits for Carrier Current Protection – Steady State andTransient Behavior of Static Relays – Testing and Maintenance – Tripping CircuitsusingThyristor.

UNIT5 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

COURSEOUTCOMES

- Abilitytosuggestsuitabilitycircuitbreaker.
- Abilitytofindthecausesofabnormaloperatingconditionsoftheapparatusand system.

TextBooks:

1. BadriramandVishwakarmaD.N.,PowerSystemProtectionandSwitchgear,Tata McGraw Hill, New Delhi, 1995.
2. RaoT.S.M.,PowerSystemProtection–StaticRelays,McGrawHill,1979.

ReferenceBooks:

1. VanC.Warrington,“ProtectionRelays–TheirTheoryandPractice”,Chapmanand Hall.
2. Ravindranath B. and Chander M., “Power System Protection and Switchgear”, Wiley Eastern, 1992.
3. RusselC.Mason,“TheArtandScienceofProtectiverelays”.

22153C63P-POWERSYSTEMOPERATIONANDCONTROL

4004

SemesterVI

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. Togetanoverviewofsystemoperationandcontrol.
ii. To understand& model power-frequency dynamics andtodesign power-frequency controller.
iii. To understand & model reactive power-voltage interaction and different methods of control for maintaining voltage profile against varying system load.

UNITI 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.

UNITII REALPOWER -FREQUENCY CONTROL 12

Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC ofsingle & Multiareas - Static&Dynamic Analysis ofuncontrolled and controlled cases – Tie line with frequency bias control – Steadystate instabilities.

UNITIII REACTIVEPOWER–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.

UNITIV UNITCOMMITMENTANDECONOMICDISPATCH 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 pointand participation factors.

UNITV COMPUTERCONTROLOFPOWERSYSTEMS 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**

COURSEOUTCOMES

- Abilitytounderstandtheday-to-dayoperationofelectricpowersystem.
- Ability to analyze the control actions to be implemented on the system to meetthe minute- to-minute variation of system demand.
- Abilitytounderstandthereactivepower-voltageinteraction.

TEXT BOOKS

1. Olle.I. Elgerd, 'Electric Energy Systems Theory – An Introduction',Tata McGrawHill Publishing CompanyLtd,NewDelhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc.,2003.
3. P.Kundur,'PowerSystem Stability & Control',McGraw HillPublications,USA, 1994.

REFERENCEBOOKS

1. D.P. Kothariand I.J. Nagrath, 'ModernPower System Analysis', Third Edition, Tata McGraw Hill PublishingCompanyLimited,NewDelhi, 2003.
2. L.L.Grigsby,'TheElectricPowerEngineering,HandBook',CRCPress&IEEE Press, 2001.

22153L65PPOWERSYSTEMSLAB

0032
SemesterVI

AIM
Tosimulateanalysisand planningcasesfor apracticalpower system.
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ListOfExperiments:

1. FormationofY-BusMatrixbyInspectionandSingulartransformationmethods.
2. LoadflowsolutionusingGaussSeidalmethod
3. LoadflowsolutionusingNewton-Raphsonmethod
4. LoadflowsolutionbyFastDecoupledmethod
5. Symmetricalshortcircuit analysis
6. UnsymmetricalFaultanalysis
7. SolutionofswingEquationusingmodifiedEulermethod
8. PowerElectronicCircuits,designandsimulationusingPspice
9. SimulationofElectricaldrivesusingMATLAB,PSCAD
10. Controlsystemdesign using MATLAB

P= 45Total= 45

COURSEOUTCOMES

- Abilitytounderstandpowersystemplanningandoperationalstudies.
- AbilitytoacquireknowledgeonFormationofBusAdmittanceandImpedance Matrices and Solution of Networks.
- Abilityto analyzethepowerflowusingGSandNRmethod
- AbilitytofindSymmetricandUnsymmetricalfault

SemesterVII

22160S71P TOTALQUALITY MANAGEMENT 3003

UNIT–I:BASICSOF TQM 9

DefinitionofQuality,DimensionsofQuality, QualityPlanning, Qualitycosts-AnalysisTechniques for Quality Costs, Basic concepts of Total Quality Management, PrinciplesofTQM, Leadership – Concepts, Role ofSeniorManagement, Quality Council, QualityStatements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.

UNIT–II:PRINCIPLES OFTQM 9

Customer satisfaction – Customer Perception of Quality, Customer Complaints, ServiceQuality, Customer Retention, Continuous Process Improvement – Juran Trilogy, PDSACycle, 5S, Kaizen, Performance Measures – Basic Concepts, Strategy, PerformanceMeasure.

UNIT–III:QUALITYCONCEPTS 9

Theseventoolsofquality,StatisticalFundamentals–MeasuresofcentralTendencyandDispersion, Population and Sample, Normal Curve, Concept of six sigma,

UNIT–IV:TQMTOOLS 9

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality FunctionDeployment (QFD) – House of Quality, QFD Process, Benefits, FMEA – Stages ofFMEA.

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

COURSEOUTCOMES

- Uponcompletion ofthecourse, students willbe abilityto have clear understandingofmanagerial functions like planning,
- organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXT BOOKS:

1. DaleH.Besterfiled,etal.,“TotalQualityManagement”,PearsonEducation, Inc. 2003. (Indian reprint 2004). ISBN 81-297-0260-6.
2. Basker,“TOTALQUALITYMANAGEMENT”,AnuradhaAgencies.

REFERENCES:

1. Feigenbaum.A.V.“TotalQualityManagement”,McGrawHill,1991.

2. Oakland.J.S.“TotalQualityManagement”,Butterworth–HcinemannLtd., Oxford. 1989.
3. NarayanaV.andSreenivasan,N.S.“Quality Management–Conceptsand Tasks”, New Age International 1996

22153C72P-ELECTRICALMACHINEDESIGN 3104

SemesterVII

AIM

Toexposethestudentstotheconstruction,principleofoperationandperformanceof special electrical machines as an extension to the studyof basic electrical machines.

OBJECTIVES

Toimpartknowledgeon

i. Construction,principleofoperationandperformanceofDCmachine.
ii. Construction,operatingCharacteristicsofsingleandthreephasetransformer.
iii. DesignandoperatingcharacteristicsofInductionmotors.
iv Construction, principle of operation, Design of synchronous machines and to have knowledge ofmachine design in CAD

UNITI 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

UNITII DC MACHINES 12

Constructional details – output equation – main dimensions - choice ofspecific loadings– choiceofnumberofpoles–armaturedesign–designoffieldpolesandfieldcoil– design of commutator and brushes – losses and efficiency calculations.

UNITIII TRANSFORMERS 12

KVA output for single and three phase transformers – Window space factor – Overall dimensions–Operatingcharacteristics–Regulation–Noloadcurrent–Temperaturerise of Transformers – Design of Tank with & without cooling tubes – Thermal rating – Methods of cooling of Transformers.

UNITIV INDUCTIONMOTORS 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.

UNITV SYNCHRONOUSMACHINES 12

Runawayspeed–construction–outputequations –choiceofloadings–Designofsalient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation ofairgap length – Design ofrotor –Design ofdamperwinding – Determinationoffullloadfieldm.m.f–Designoffieldwinding–Designofturbo alternators – Rotor design - Introduction to computer aided design – Program to designmain dimensions of Alternators.

Total= 60

COURSEOUTCOMES

- Abilitytounderstandbasicsofdesignconsiderationsforrotatingandstatic electrical machines
- Abilitytodesignoffield systemforitsapplication.
- Abilitytodesignsingandthreephase transformer.
- AbilitytodesignarmatureandfieldofDCmachines.

REFERENCEBOOKS:

1. Sawhney, A.K.,'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

22153C73P-POWERPLANTENGINEERING

4004
SemesterVII

UNITI-THERMAL POWER PLANTS 9

Basic thermodynamic cycles – Various components of steam power plant – Layout – Pulverized coal burners – Fluidized bed combustion – Coal handling systems – Ash handlingsystems–Forceddraftandinduceddraftfans–Boilers–Feedpumps–Super heater – Regenerator – Condenser –Deaerators – Cooling tower

UNITII - HYDROELECTRICPOWERPLANTS 9

Layout–Dams–Selectionofwaterturbines–Types–Pumpedstoragehydelplants

UNITIII -NUCLEARPOWERPLANTS 9

Principlesofnuclear energy–Fissionreactions–Nuclearreactor–Nuclearpowerplants

UNITIV-GAS ANDDIESELPOWERPLANTS 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

UNITV-NON–CONVENTIONAL POWERGENERATION 9

Solar energy collectors – OTEC – Wind power plants – Tidal power plants and geothermal resources – Fuel cell – MHD power generation – Principle – thermoelectric power generation – Thermionic power generation.

L:45 T:15Total:60

COURSEOUTCOMES

- AbilitytocreateawarenessaboutrenewableEnergySourcesandtechnologies.
- Abilitytoget adequateinputsonavarietyofissuesinharnessingrenewable Energy.
- Abilitytorecognizecurrent andpossiblefutureroleofrenewableenergysources.

TEXTBOOKS

1. AroraandDomkundwar, “ACourseinPowerPlantEngineering”,DhanpatRai.
2. Nag,P.K.,“PowerPlantEngineering”,2ndEdition,TataMcGrawHill,2003.

REFERENCES

1. Bernhardt,G.A.,SkrotzkiandWilliamA.Vopat,“PowerStationEngineeringand Economy”, 20th Reprint, Tata McGraw Hill, 2002.
2. Rai,G.D.,“AnIntroductiontoPowerPlantTechnology”,KhannaPublishers.
3. El-Wakil,M.M.,“PowerPlantTechnology”,TataMcGrawHill,198

ELECTIVE-I

22153E44AP-ELECTROMAGNETIC THEORY

3104
Semester-IV

AIM

To expose the students to the fundamentals of electromagnetic fields and their applications in Electrical Engineering**.**

OBJECTIVES:

- Tointroducethebasicmathematicalconceptsrelatedtoelectromagneticvector fields
- Toimpartknowledgeontheconceptsofelectrostatics, electricalpotential, energy density and their applications.
- To impart knowledge on the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
- To impart knowledge on the concepts of Faraday's law, induced Emf and Maxwell's equations
- To impart knowledge on the concepts of Concepts of electromagnetic waves and Pointing vector.

UNITI:ELECTROSTATICS–I 12

Sources and effects of electromagnetic fields – Coordinate Systems – Vector fields – Gradient,Divergence,Curl –theoremsand applications -Coulomb'sLaw –Electricfield intensity – Field due to discrete and continuous charges – Gauss's law and applications

UNIT II: ELECTROSTATICS – II 12

Electric potential – Electric field and equipotential plots, Uniform and Non-Uniform field, Utilization factor – Electric field in free space, conductors, dielectrics - Dielectric polarization – Dielectric strength - Electric field in multiple dielectrics – Boundary conditions, Poisson's and Laplace's equations, Capacitance, Energy density,Applications.

UNITIII: MAGNETOSTATICS 12

Lorentz force, magnetic field intensity(H) – Biot–Savart's Law - Ampere's CircuitLaw– H due to straight conductors, circular loop, infinite sheet of current, Magnetic flux density (B) – B in free space, conductor, magnetic materials – Magnetization, Magnetic field in multiple media – Boundary conditions, scalar and vector potential, Poisson's Equation, Magnetic force, Torque, Inductance, Energy density, Applications

UNITIV:ELECTRODYNAMICFIELDS 12

Magnetic Circuits - Faraday's law – Transformer and motional EMF – Displacement current - Maxwell's equations (differential and integral form) – Relation between field theory and circuit theory – Applications

UNITV:ELECTROMAGNETICWAVES 12

Electromagnetic wave generation and equations – Wave parameters; velocity, intrinsic impedance,propagationconstant–Wavesinfreespace,lossyandlosslessdielectrics, conductors- skin depth - Poynting vector – Plane wavereflection and refraction – Standing Wave – Applications.

TOTAL=45

COURSEOUTCOMES

- Ability tounderstandandapply basicscience,circuittheory,Electro-magnetic field theory control theory and apply them to electrical engineering problems.

TEXT BOOKS

1. Mathew N.O. Sadiku, 'Principles of Electromagnetics', 4 th Edition ,OxfordUniversity Press Inc, First India edition, 2009.
2. AshutoshPramanik,'Electromagnetism–TheoryandApplications',PHILearning Private Limited, New Delhi, Second Edition-2009.
3. K.A.Gangadhar,P.M.Ramanthan'ElectromagneticFieldTheory (including Antennaes and wave propagation', 16th Edition, Khanna Publications, 2007..

REFERENCEBOOKS

1. Joseph.A.Edminister,'Schaum'sOutlineofElectromagnetics,ThirdEditionSchaum's Outline Series), Tata McGraw Hill, 2010.
2. William H. Haytand John A. Buck,'Engineering Electromagnetics',Tata McGraw Hill 8th Revised edition, 2011.
3. Kraus andFleish,'ElectromagneticswithApplications',McGrawHill International Editions, Fifth Edition, 2010.
4. BhagSingh Guru andHüseyin R. Hiziroglu "Electromagnetic field theory Fundamentals", Cambridge University Press; Second Revised Edition, 2009

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ELECTIVE-I

22153E44BP-FUZZYLOGICANDITSAPPLICATIONS

3104
Semester-IV

UNITI-FUZZYLOGIC **7**

Fuzzy sets – Fuzzy operation – Fuzzy arithmetic – Fuzzy relational equations – Fuzzy measure – Fuzzy functions – approximate reasoning – Fuzzy proposition – Fuzzy quantifiers-if-then rules.

UNITII-FUZZYLOGICINCONTROL **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.

UNITIII-NEURALNETWORKSIN CONTROL **8**

Neural Network for Non-Linear systems – schemes of Neurocontrol-system identification forward model and inverse model – indirect learningneuralnetwork control applications – Case studies.

UNITIV- MODELING ANDCONTROLOFFACTSDEVICESNEURALAND 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 ofTransient stabilitysystems–GAforAdaptive fuzzysystem– casestudy.

UNITV-STABILITYSTUDIESUNDERMULTIPLEFACTSENVIRONMENT **12**

Introduction to small signal analysis – simulation and modeling of FACTS controllersfor 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

COURSEOUTCOMES

- Abilitytodesigncombinationalandsequential Circuits.
- Abilitytosimulateusingsoftwarepackage.
- Abilitytostudyvariousnumbersystemsandsimplifythelogicalexpressions using Boolean functions
- Abilitytodesignvarioussynchronousandasynchronouscircuits.
- AbilitytointroduceasynchronoussequentialcircuitsandPLDs

- Abilitytointroducedigitalsimulationfordevelopmentofapplicationoriented logic circuits.

REFERENCES:

1. KOSKO. B. "Neural Networks and Fuzzy systems", Prentice-Hall of India Pvt.Ltd.,1994.
2. Driankov,Hellendroon,"IntroductiontoFuzzycontrol"NarosaPublisher.
3. Ronald R.Yager and Dimitar P.Filev "Essential of fuzzy modeling and control " John Wiley & Sons, Inc.
4. EnriqueAcha,ClaudioR.Fuerte-Esqivel,Hugo Ambriz-Perez,CesarAngeles-Camacho"FACTS–ModelingandsimulationinPowerNetworks"JohnWiley&Sons.
5. KundurP.,"Powersystemstabilityandcontrol",McGrawHill,1994.

ELECTIVE-I

22153E44CP - BIOMEDICALINSTRUMENTATION

4004

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. Toprovideanacquaintanceofthephysiologyoftheheart,lung,bloodcirculationand circulation respiration. Methods of different transducers used.
ii. To introducethe student to thevarioussensing and measurement devices ofelectrical origin.
iii. Toprovidethelatestideasondevicesofnon-electricaldevices.
iv. Tobringouttheimportantandmodernmethodsofimagingtechniques.
v. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

UNIT I BASICPHYSIOLOGY 9

Cells and their structures –Transport of ions through cellmembrane – 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 BASICTRANSDUCERPRINCIPLESANDELECTRODES 9

Transducer principles - Active transducers - Passive transducers -Transducer for Bio-medical application-Electrode theory- Bio-potential electrode -Bio - chemical transducer.

UNITIII CARDIOVASCULARSYSTEM 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-RAYANDRADIOISOTOPEINSTRUMENTATION 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

COURSEOUTCOMES

- Abilitytounderstandfundamentalsof Biomedicalinstrumentation.
- To acquire knowledge on Bio-Medical and Non-Electrical parameter measurements.

- Toknowthevariousmedicalimagingequipment.

REFERENCE BOOKS:

1. Lesis CromwellFred, J.Werbell and Erich A.Pfraffer, Biomedicalinstrumentation and Measurements – Prentice Hall of India, 1990.
2. M.Arumugam,Bio-medicalInstrumentation–AnuradhaAgenciesPublishers,1992.
3. Khandpur,Handbook onBiomedicalInstrumentation–Tata McGrawHill CoLtd., 1989.

ELECTIVE-I
Semester-IV

22153E44DP-MODELINGANDSIMULATIONOFSOLARENERGY SYSTEMS

4004

UNITI: SOLARRADIATIONANDCOLLECTORS 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.

UNITI: APPLICATIONSOFSOLARTHERMAL TECHNOLOGY 9

Principleofworking,types-designandoperationof -solarheatingandcoolingsystems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying.

UNITIII:SOLARPVFUNDAMENTALS 9

Semiconductor – properties - energy levels - basic equations of semiconductor devices physics. Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface-darkandilluminationcharacteristics -figureofmeritsofsolar 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 junctionsolarcell;a-Si-H based solar cells-quantumwell solar cell-thermophotovoltaics.

UNITIV:SOLARPHOTOVOLTAICSYSTEMDESIGNANDAPPLICATIONS 9

Solarcellarraysystemanalysisandperformanceprediction-Shadowanalysis: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 andtroubleshooting - 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.

UNITV:SOLARPASSIVEARCHITECTURE 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 efficientlandscape design- thermal comfort– concept ofsolar temperature and its significance - calculation of instantaneous heat gain through building envelope.

TOTAL: 45

<u>COURSEOUTCOMES</u>

- BasicknowledgeinPowersystemplanning,operationandmodelingoflargescale power systems.
- Abilitytounderstandthevariousfaultsoccurringinpowersystemandtosolve load flow problems using numerical methods.
- Abilitytoanalyzethepowersystemtransientsandfaultsandselecttheratingfor protective devices.

TEXT BOOKS:

1. SukhatmeSP,SolarEnergy,TataMcGrawHill, 1984.
2. Kreider,J.F.andFrankKreith,SolarEnergyHandbook,McGrawHill,1981.
3. Goswami,D.Y.,Kreider,J. F.and&Francis., PrinciplesofSolarEngineering,2000.

REFERENCES:

1. Garg H P., Prakash J., Solar Energy: Fundamentals & Applications, Tata BMcGrawHill, 2000.
2. Duffie,J.A.andBeckman,W.A.,SolarEngineeringofThermalProcesses,John Wiley, 1991.
3. AlanLFahrenbruchandRichardHBube,FundamentalsofSolarCells:PVSolar Energy Conversion, Academic Press, 1983.
4. LarryDPartain,SolarCellsandtheirApplications,JohnWileyandSons,Inc,1995.
5. Roger MessengerandJerry Vnetre,PhotovoltaicSystemsEngineering,CRCPress, 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,JandRabi,A.,HeatingandCoolingofBuildings:DesignforEfficiency, McGraw-Hill, 1994.

22153E44EPNON-CONVENTIONALENERGYSYSTEMSAND APPLICATIONS 2 0 2 4

AIM

TolearnabouttheRenewableenergysystemandconversiontechnologiesrelated to various aspects of non-conventional systems.

OBJECTIVES

- toidentifysuitableutilityforthesolarandwind energysystems,
- toconductasitesurveyforinstallationofawindmillduringSixth Expedition ,
- tostudythestructuralandfoundationaspectsforinstallingawindmillat Maitree station in Schirmacher hills

UNIT-I **9**

Introduction to renewable energy various aspects of energy conversion-Principle of renewable energy systems environment and social implications

UNIT-II **9**

Solar energy: Solar radiation components- measurements-estimation-solar collectors-solar water heaters- Calculation-Types-analysis-economics-Applications Solar thermal power generation Solar Photovoltaics- energy conversion principle-classifications-equivalent circuit-characteristics-Cell efficiency- Limitations-PV modules-MPPT algorithms

UNIT-III **9**

Wind energy: Basics of wind-wind turbines-power and energy from wind turbine-characteristics- types of electric generators for wind power generation. Dynamics matching- performance of wind generators - applications- economics of wind power

UNIT-IV **9**

Storage Devices: Super capacitor-SMES- Battery storage-flywheel storage- compressed airstorage-Fuelcells–typesandapplications;MHDgenerators –backup -Systemdesign-industrial and domestic applications.

UNIT-V **9**

Bioenergy: Bio fuels-classification-biomass conversion technologies-applications; Ocean Energy: Tidal energy-wave energy-ocean thermal energy conversion systems-applications; - mini, micro and pico hydel power

Total:45

TEXT/REFERENCEBOOKS:

1. Godfrey Boyle,“RenewableEnergy:Powerfor asustainablefuture”,Oxford University press, Second edition.

2. RaiGD,“SolarEnergyUtilization”,KhannaPublishers,1997.
3. BHKhan,“Non-ConventionalEnergyResources”,TheMcGraw-HillCompanies, Second Edition.
4. Sukhatme,S.P, “SolarEnergy-PrinciplesofThermalCollectionandStorage”,Tata
5. McGraw-Hill,2ed.,1997.
6. Sammes,Nige,“FuelCellTechnologies-Stateand Perspectives”,Springerpublication, 2005
7. Kreith, F., and Kreider, J.F., “Principles of Solar Engineering”, Mc-Graw-Hill BookCo, 1978.
8. S.L.Soo,“DirectEnergyConversion”,PrenticeHallPublication,1968
9. JamesLarminie,AndrewDicks,“FuelCellSystems”,Wiley&SonsLtd,2ed,2003.

22153E54AP ENVIRONMENTAL SCIENCE AND ENGINEERING 4 0 0 4

UNITI-INTRODUCTIONTOENVIRONMENTALSTUDIESANDNATURALRESOURCES 10

Definition, scope and importance – need for public awareness – forest resources: use and over-exploitation, deforestation,. Timber extraction, mining, dams-benefits and problems – mineralresources: use and effects on forests and tribal people – water resources: use and over-utilizationof surface and exploitation, environmental effects of extracting and using mineral resources, casestudies – 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 ofalternate energy sources. Case studies – land resources: land as a resource, land degradation, maninduced landslides, soil erosion and desertification – role of an individual in conservation ofnatural resources.

UNITII-ECOSYSTEMSANDBIODIVERSITY 14

Concept of an ecosystem – structure and function of an ecosystem – producers, consumers anddecomposers – energy flow in the ecosystem – ecological succession – food chains,food websand ecological pyramids– introduction, types, characteristic features, structure and function ofthe (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem.Introductiontobiodiversity – definition: genetic, species and ecosystem diversity–biogeographicalclassification 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.

UNITIII-ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) air pollution (b) water pollution (c) soilpollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards –– roleof an individual in prevention of pollution – pollutioncase studies – disastermanagement: floods,earthquake, cyclone and landslides.

UNITIV-SOCIALISSUESANDTHEENVIRONMENT 7

Fromunsustainabletosustainabledevelopment–urbanproblemsrelatedtoenergy–waterconservation, rain water harvesting, watershed management

environmental ethics: issues and possible solutions – climate change, global warming, acid rain,ozonelayer depletion, nuclear accidents. environmentproductionact –air(preventionandcontrol of pollution) act – water(prevention and control ofpollution) act – wildlife protection act – forestconservation act – issues involved in enforcement of environmental legislation – publicawareness

UNITV-HUMANPOPULATIONANDTHEENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfareprogramme– environmentandhumanhealth –humanrights–valueeducation–hiv/aids–womenandchildwelfare – role of information technologyin environment and human health – casestudies.

TOTAL: 45

COURSEOUTCOMES

- Playaimportantroleintransferringahealthyenvironmentforfuturegenerations
- Analyzetheimpactofengineeringsolutionsinaglobalandsocietalcontext
- Discuss contemporaryissues that results inenvironmentaldegradation and would attempt to provide solutions to overcome those problems

TEXTBOOKS

1. Gilbert M .Masters, “Introduction to Environmental Engineering and Science”, Pearson Education Pvt., Ltd., Second Edition, ISBN 81-297-0277-0, 2004.
2. MillerT.G.Jr.,“EnvironmentalScience”,WadsworthPublishingCo.

REFERENCES

1. Bharucha Erach, “TheBiodiversityof India”, MapinPublishingPvt. Ltd., Ahmedabad India.
2. TrivediR.K.,“HandbookofEnvironmentalLaws,Rules,Guidelines,Compliances and Standards”, Vol. I and II, Enviro Media.
3. Cunningham,W.P.Cooper,T.H.Gorhani,“EnvironmentalEncyclopedia”,Jaico Publ., House, Mumbai, 2001.
4. Wager K.D. “EnvironmentalManagement”, W.B. Saunders Co., Philadelphia, USA, 1998.
5. TownsendC.,HarperJandMichaelBegon,“EssentialsofEcology,BlackwellScience.
6. TrivediR.K.andP.K.Goel,IntroductiontoAirPollution,Techno-SciencePublications.

ELECTIVE-II
Semester-v

22153E54BP-ARTIFICIALNEURALNETWORKS 4 0 0 4

UNITI:INTRODUCTIONTOARTIFICIALNEURALNETWORKS 12
Biologicalneuralnetworks-Patternanalysistasks:Classification,Regression,Clustering -Computationalmodelsofneurons-Structuresofneuralnetworks-Learningprinciples

UNITII:LINEARMODELSFORREGRESSIONANDCLASSIFICATION 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

UNITIII:FEEDFORWARDNEURALNETWORKS 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

UNITIII:RADIALBASIS FUNCTION NETWORKS 12
Regularization theory - RBF networks for function approximation - RBF networks for pattern classification

UNITIV:KERNELMETHODSFORPATTERN ANALYSIS 12
Statistical learning theory- Support vector machines for pattern classification- Support vector regression for function approximation- Relevance vector machines for classification and regression

UNITV:SELF-ORGANIZING MAPS 12
Patternclustering-Topologicalmapping-Kohonen'sself-organizingmap

FEEDBACKNEURALNETWORKS

Pattern storage and retrieval- Hopfield model- Boltzmann machine- Recurrent neural networks

TOTAL=60

<u>COURSEOUTCOMES</u>

- Analysisoftransientsusingvariousparametric&nonparametric methods.
- Analysisofvariouscontrolschemesusendforcontrollingapplications
- studyabouttheadaptivecontrolsystemsforvariousapplications&studyof issues in it.

TextBooks:

1. B.Yegnanarayana, ArtificialNeuralNetworks,PrenticeHallofIndia, 1999
2. SatishKumar,NeuralNetworks–AClassroomApproach,TataMcGraw-Hill, 2003
3. S.Haykin,NeuralNetworks–AComprehensiveFoundation,PrenticeHall,1998
4. C.M.Bishop,PatternRecognitionandMachineLearning,Springer,2006

ELECTIVE-II
Semester-v

22153E54CP-VLSIDESIGN 3 10 4

OBJECTIVES:

- Inthiscourse,theMOScircuitrealizationofthevariousbuildingblocks that is common to any
- microprocessorordigitalVLSIcircuitisstudied.
- Architectural choices and performance tradeoffs involved in designing and realizing the circuits in
- CMOStechnologyarediscussed.
- Themainfocusinthiscourseisonthetransistorcircuitleveldesignand realization for digital

UNITI MOSTRANSISTOR PRINCIPLE 9

NMOS and PMOS transistors, Process parameters for MOS and CMOS, Electrical propertiesofCMOScircuitsanddevicemodeling,Scalingprinciplesandfundamental limits, CMOS inverter scaling, propagation delays, Stick diagram, Layout diagrams

UNITIICOMBINATIONALLOGIC CIRCUITS 9

Examples of Combinational Logic Design, Elmore's constant, Pass transistor Logic, Transmission gates, static and dynamic CMOS design, Power dissipation – Low power design principles

UNITIII SEQUENTIALLOGICCIRCUITS 9

Static and Dynamic Latches and Registers, Timing issues, pipelines, clock strategies, Memory architecture and memory control circuits, Low power memory circuits, Synchronous and Asynchronous design

UNITIVDESIGNING ARITHMETICBUILDINGBLOCKS 9

Data path circuits, Architectures for ripple carry adders, carry look ahead adders, High speed adders, accumulators, Multipliers, dividers, Barrelshifters, speed and areatradeoff

UNITV IMPLEMENTATIONSTRATEGIES 9

Full custom and Semi custom design, Standard cell design and cell libraries, FPGA building block architectures, FPGA interconnect routing procedures.

TOTAL 45

<u>COURSEOUTCOMES</u>

Uponcompletionofthecourse,students should

- ExplainthebasicCMOScircuitsandtheCMOSprocesstechnology.
- Discussthetechniquesofchipdesignusingprogrammabledevices.
- ModelthedigitalsystemusingHardwareDescription Language.

TEXTBOOKS:

1. JanRabaey, AnanthaChandrakasan, B.Nikolic, "DigitalIntegratedCircuits: A Design Perspective", Second Edition, Prentice Hall of India, 2003.
2. M.J.Smith,"ApplicationSpecificIntegratedCircuits",AddissonWesley,1997

REFERENCES:

1. N.Weste, K.Eshraghian,“Principles of CMOS VLSI Design”,Second Edition, Addision Wesley 1993
2. R.JacobBaker,HarryW.LI.,DavidE.Boyee,“CMOSCircuitDesign,Layoutand Simulation”, Prentice Hall of India 2005
3. A.Pucknell, KamranEshraghian, “BASIC VLSI Design”, Third Edition, PrenticeHall of India, 2007.

ELECTIVE-II
Semester-v

22153E54DP-ROBOTICS

31 0 4

UNITI:INTRODUCTION **9**

Robot,itsevaluation;definitionandaesofrobotics,presentapplicationstatus.

UNITII: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 ofcontrollers, ON-OFF, proportional, integral, PI, PD, PID.

UNITIII:ROBOT ENDEFFECTORS: **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:ROBOTKINEMATICS **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 .

UNITV: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.

COURSEOUTCOMES

- Abilitytounderstandand develop MFC windowsapplications with inputs and drawing features and implement menus using VC++
- Abilityto understand document/view architecture and develop classic controls using VC++
- Ability to understand and design event driven programming and activeX controls and manage database using visual basic

BOOKSRECOMMENDED:
1.Schilling-Fundamental of robotics; PH
2.Yoshikawa-Fundamentalofrobotics;PH
3. S.R.Deb-RoboticsTechnologyandFlexibleAutomation
4. IntroductiontoRobotics,JohnJCraig;PearsonEducation

22153E54EP LT&HTDISTRIBUTIONSYSTEMS 2 0 2 4

AIM

To become familiar with the function of different components used in Transmission and Distribution levels of power systems and modeling of these components.

OBJECTIVES

- To develop expression forcomputationoffundamentalparametersofPower system analysis.
- To categorize the lines into different classes and develop equivalent circuits forthese classes.
- ToanalyzethevoltagedistributioninArchitecturesanduserinterface.

UNIT-I **9**

Power system-general concepts-distribution of power, load and energyforecasting- factors in power system loading, Power system analysis-load flow-fault studies-voltage control.

UNIT-II **9**

Optimization of distribution system network cost modeling-economic loading of distributiontransformers. Distribution system reliability-reliabilityassessment techniques

UNIT-III **9**

Consumer services-maximum demand, diversity and load factor-consumer load control for power shortages, Tariffs-costing and pricing –economically efficient tariff structure. Overhead and underground lines-optimum design considerations, Powercapacitors-size of capacitor for power factor improvement- HT and LT capacitor installation requirements.

UNIT-IV **9**

Distribution System Design- Electrical Design Aspects of Industrial, Commercials Buildings- Design, estimation and costing of outdoor and indoor Substations, Electrical SafetyandEarthingPracticesatvariousvoltagelevels-Lightningprotection.-Regulations and standards.

UNIT-V **9**

Distribution Automation System : Necessity, System Control Hierarchy- Basic Architecture and implementation Strategies for SCADA and DAC systems -Basic Distribution Management System Functions. Communication Systems for Control and Automation- Wireless and wired Communications- SCADA and DAC communication Protocols, Architectures and user interface

Total:45

Text/References:

1. TuranGonen,“ElectricPowerDistributionsystemEngineering”McGraw-hill ,Inc,1987
2. A.S.Pabla,“ElectricPowerDistributionsystems”TataMcGraw-hillPublishing company limited,4thedition,1997.
3. Alexander EigelesEmanuel, “Power DefinitionsandthePhysical Mechanismof Power Flow”, John Wiley & Sons, October 2009.
4. “Handbookof InternationalElectricalSafety Practices”,JohnWiley& Sons,PERI June 2009.
5. AliA.Chowdhury,DonO.Koval,“Powerdistributionsystemreliability-Practical methods and applications” John Wiley & sons Inc., *IEEE Press* 2009
6. RichardE.Brown,“Electricpowerdistributionreliability”Taylor&Francis Group,LLC,2009.
7. James Northcote-Green, Robert Wilson, “Control and automation of electrical power distribution system”, Taylor & Francis Group, LLC,2007.
8. S.Sivanagaraju,V.Sankar,DhanpatRai&Co,“ElectricalPowerDistributionand Automation”,2006.
9. Pansini,Anthony J,“Guidetoelectricalpowerdistributionsystem”,Fairmontpress, inc., 6th edition,2006.
10. StuartA.Boyer,“SCADA-Supervisory ControlandDataAcquisition”Instrument Society of America Publication,2004
11. Leveque,Francois,“TransportPricingofElectricityNetworks”Springer2003
13. Lakervi & E J Holmes, “Electricity distribution network design”, Peter PeregrimusLtd. 2nd Edition,2003
13. William H. Kersting, “Distribution system modeling and analysis” CRC press LLC, 2002.
14. MichaelWiebe,“AGuidetoUtility Automation:Amr,Scada,andItSystemsfor Electric Power” PennWell,1999.
15. IEEE Press: IEEE Recommended practice for Electric Power Distribution for Industrial Plants, publish

ELECTIVEIII
SemesterVI

22153E64AP-PRINCIPLESOFMANAGEMENT 4004

OBJECTIVE

i. To understand the TotalQualityManagement concept and principles and thevarioustools available to achieve Total Quality Management.
ii. Tounderstandthestatisticalapproachforqualitycontrol.
iii. TocreateanawarenessabouttheISOandQScertificationprocessand

itsneedfortheindustries

UNITI HISTORICALDEVELOPMENT 12

Definition of Management – Science or Art – Management and Administration – DevelopmentofManagementThought –ContributionofTaylorandFayol – FunctionsofManagement – Types of Business Organisation.

UNITII PLANNING 12

Nature & Purpose – Steps involved in Planning – Objectives – Setting Objectives – Process of Managing by Objectives – Strategies, Policies & Planning Premises- Forecasting – Decision-making.

UNITIII ORGANISING 12

Nature and Purpose – Formal and informal organization – Organization Chart – Structureand 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.

UNITIV DIRECTING 12

Scope – Human Factors – Creativity and Innovation – Harmonizing Objectives – Leadership – Types of Leadership Motivation – Hierarchy of needs–Motivationtheories – Motivational Techniques –Job Enrichment – Communication – Process ofCommunication – Barriers and Breakdown –Effective Communication – Electronicmedia in Communication.

UNITV CONTROLLING 12

System and process of Controlling – Requirements for effective control – The Budget asControl Technique – Information Technology in Controlling – Use of computers inhandling the information – Productivity – Problems and Management – ControlofOverall Performance – Direct and Preventive Control – Reporting – The GlobalEnvironment – Globalization and Liberalization – International Management and Globaltheory of Management.

TOTAL =

60<u>COURSEOUTCOM</u>

<u>ES</u>

- BasicKnowledgeonmanagement,business,organizationculture, environment and planning process.
- Abilitytoorganizebusinessactivities,motivationaltechniquesand effective communication.
- Abilitytounderstandthemanagementcontrolandbudgetarytechniques.

TEXT BOOKS

1. HaroldKooritz&HeinzWeihrich“EssentialsofManagement”, TataMcgraw Hill,1998.
2. JosephLMassie“EssentialsofManagement”,PrenticeHallofIndia,(Pearson) Fourth Edition, 2003.

REFERENCEBOOKS

1. TripathyPCAndReddyPN,“PrinciplesofManagement”,TataMcgrawHill,1999.
2. Decenzo David, Robbin Stephen A, ”Personnel and Human Reasons Management”, Prentice Hall of India, 1996.
3. JAFStomer,FreemanR.EandDanielRGilbert Management,PearsonEducation, Sixth Edition, 2004.
4. FraidoonMazda,“EngineeringManagement”, AddisonWesley,-2000.

ELECTIVES-III
SEMESTERVI

22153E64BP-MICROELECTROMECHANICALSYSTEMS4004

AIM:

- ToprovideknowledgeofsemiconductorsandsolidmechanicstofabricateMEMS devices.
- ToeducateontherudimentsofMicrofabricationtechniques.
- Tointroduce varioussensors and actuators
- TointroducedifferentmaterialsusedforMEMS
- ToeducateontheapplicationsofMEMStodisciplinesbeyondElectricaland Mechanical engineering.

UNITI 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 – Flexuralbeambending-Torsionaldeflection.

UNITII SENSORSAND 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.

UNITIII SENSORSAND ACTUATORS-I 9

Piezoresistivesensors–Piezoresistivesensormaterials-Stressanalysisofmechanical elements –Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectriceffects–piezoelectricmaterials–ApplicationstoInertia,Acoustic,Tactile and Flow sensors.

UNITIV MICROMACHINING 9

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching –Deep Reaction Ion Etching (DRIE) – Isotropic WetEtching – Gas PhaseEtchants–Casestudies-Basicsurfacemicromachiningprocesses – Structuraland Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundryprocess..

UNITV POLYMERAND 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

COURSEOUTCOMES

- Abilitytounderstandtheoperationofmicrodevices,microsystemsandtheir applications.
- Abilitytodesignthemicrodevices,microsystemsusingtheMEMSfabrication process.

TEXT BOOKS

1. ChangLiu,‘FoundationsofMEMS’,PearsonEducationInc., 2012.
2. StephenDSenturia,‘MicrosystemDesign’,SpringerPublication,2000.
3. TaiRanHsu,“MEMS&MicrosystemsDesignandManufacture”TataMcGrawHill, New Delhi, 2002.

REFERENCEBOOKS

1. NadimMaluf,“AnIntroductiontoMicroElectroMechanicalSystemDesign”,Artech House, 2000.
2. MohamedGad-el-Hak,editor,“TheMEMSHandbook”,CRCpressBacoRaton,2001.
3. Julianw. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. JamesJ.Allen,MicroElectro MechanicalSystemDesign,CRCPressPublisher,2005.
5. ThomasM.AdamsandRichardA.Layton, “IntroductionMEMS,Fabricationand Application,” Springer, 2010.

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ELECTIVES-III
SEMESTER-VI

22153E64CP INTEGRATEDOPTO-ELECTRONICDEVICES 3104

AIM

Tolearndifferenttypesofopticalemission,detection,modulationandoptoelectronic integrated circuits and their applications.

OBJECTIVE

• To knowthe basics of solid state physics and understand the nature and characteristics of light.
• Tounderstanddifferent methodsofluminescence,displaydevicesandlasertypesand their applications.
• To understand different light modulation techniques and the concepts and applications ofoptical switching.

UNITI: ELEMENTSOFLIGHTANDSOLIDSTATEPHYSICS 9

Wave nature of light, Polarization, Interference, Diffraction, Light Source, review of QuantumMechanicalconcept,ReviewofSolidStatePhysics,Reviewof SemiconductorPhysicsandSemiconductor JunctionDevice.

UNITII:DISPLAYDEVICESANDLASERS 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, LaserModes, Classes ofLasers, Mode Locking,laserapplications.

UNITIII:OPTICAL DETECTIONDEVICES 9

Photodetector,Thermaldetector,PhotoDevices,PhotoConductors,Photodiodes, Detector Performance.

UNITIVOPTOELECTRONIC MODULATOR 9

Introduction, Analog and Digital Modulation, Electro-optic modulators, Magneto Optic Devices,Acoustopticdevices,Optical,SwitchingandLogicDevices.

UNITV OPTOELECTRONICINTEGRATED CIRCUITS 9

Introduction,hybridandMonolithicIntegration,ApplicationofOptoElectronicIntegrated circuits, integrated transmitters and Receivers, Guided wave devices.

<u>COURSEOUTCOMES</u>

- Abilitytounderstandandanalyze Instrumentationsystemsandtheirapplications to various industries.
- Abilitytoknowthebasicpropertiesoflaserandtoapplyforindustry.
- Recognizetheimportanceoflaserinmedicinalandindustryapplications.

TEXTBOOK

1. J. Wilson and J.Haukes, “Opto Electronics – An Introduction”, Prentice Hall of India Pvt. Ltd.,NewDelhi,1995.

REFERENCES

1. Bhattacharya“SemiconductorOptoElectronicDevices”,PrenticeHallofIndiaPvt., Ltd., NewDelhi,1995.

2. JaspritSingh,“OptoElectronics–AsIntroductiontomaterialsanddevices”,McGraw- Hill International Edition, 1998.

22153E64DP-COMPUTERAIDEDDESIGNOFELECTRICALAPPARATUS

3104

AIM

TointroducethebasicsofComputerAidedDesigntechnologyforthedesignof Electrical Machines.

OBJECTIVE

Attheend ofthiscoursethe studentwillbeable to

- Learntheimportanceofcomputeraideddesign method.
- Understand the basic electromagnetic field equations and the problem formulation for CAD applications.
- BecomefamiliarwithFiniteElementMethodasapplicableforElectricalEngineering.
- KnowtheorganizationofatypicalCADpackage.
- ApplyFiniteElementMethodforthedesignofdifferentElectrical apparatus.

UNITI:INTRODUCTION 12

Conventional design procedures – Limitations – Need for field analysis based design – Review of Basic principles of energy conversion – Development of Torque/Force.

UNITII:MATHEMATICAL FORMULATIONOFFIELD PROBLEMS 12

ElectromagneticFieldEquations–MagneticVector/Scalarpotential–Electricalvector /Scalar potential – Stored energy in Electric and Magnetic fields – Capacitance - Inductance- Laplace and Poisson's Equations – Energy functional.

UNITIII:PHILOSOPHYOFFEM 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.

UNITIV: CAD PACKAGES 12

ElementsofaCADSystem–Pre-processing–Modeling–Meshing– Material properties- Boundary Conditions – Setting up solution – Post processing.

UNITV:DESIGNAPPLICATIONS 12

Voltage Stress in Insulators – Capacitance calculation - Design of Solenoid Actuator – Inductance and force calculation – Torque calculation in Switched Reluctance Motor.

COURSEOUTCOMES

- Thestudents will obtain the knowledge of basic electric and magnetic materialsanddesignofrotatingelectricalMachinesandTransformers.
- Thestudentswill beabletooveralldesignthemachinesand transformers.

- Thestudentswillgainknowledgeaboutthevarioustypesofelectrical machinesanddesignofbothac&dcMachinesand manyapplication.

TEXT BOOKS

1. S.J Salon, ‘Finite Element Analysis of Electrical Machines’, Kluwer Academic Publishers, London, 1995.
2. NicolaBianchi,‘ElectricalMachineAnalysisusingFiniteElements’,CRCTaylor& Francis, 2005.

REFERENCES

1. JoaoPedro,A.BastosandNelson Sadowski,‘ElectromagneticModelingby 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.LowtherandP.PSilvester,‘ComputerAidedDesigninMagnetics’,Springer Verlag, New York, 1986.
4. S.R.H.Hoole,‘ComputerAidedAnalysisandDesignofElectromagneticDevices’, Elsevier, New York, 1989.
5. UserManualsofMAGNET,MAXWELL&ANSYS Softwares.

22153E64EP ADVANCEDDC-ACPOWERCONVERSION 2 0 2 4

AIM

TostudyadvancedDC-ACpowerconversiontechnologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I TWO-LEVELVOLTAGESOURCEINVERTER 9

Introduction **- Sinusoidal PWM** - Modulation Scheme - Harmonic Content – Over-modulation – Third Harmonic Injection PWM - **Space Vector Modulation** - Switching States - Space Vectors - Dwell Time Calculation - Modulation Index - Switching Sequence - Spectrum Analysis - Even-Order Harmonic Elimination -Discontinuous Space Vector Modulation

UNIT-II CASCADEDH-BRIDGE(CHB)MULTILEVELINVERTERS9

Introduction **- H-Bridge Inverter** - Bipolar Pulse-Width Modulation - Unipolar Pulse-Width Modulation –**Multilevel Inverter Topologies -** CHB Inverter with Equal dc Voltage - H-Bridges with Unequal dc Voltages.

Carrier Based PWM Schemes - Phase-Shifted Multicarrier Modulation - Level-Shifted Multicarrier Modulation - Comparison Between Phase- andLevel-ShiftedPWM Schemes - Staircase Modulation.

UNIT-III DIODE-CLAMPEDMULTILEVELINVERTERS 9

Introduction **-Three-Level Inverter -** Converter Configuration - Switching State - Commutation - Space Vector Modulation - Stationary Space Vectors - Dwell Time Calculation - Relationship Between *Vref* Location and Dwell Times -Switching Sequence Design -Inverter Output Waveforms and Harmonic Content - Even-Order Harmonic Elimination - **Neutral-Point Voltage Control** - Causes of Neutral-Point Voltage Deviation – Effect of Motoring and Regenerative Operation - Feedback Control of Neutral-Point Voltage

UNIT-IV 9

OtherSpaceVectorModulationAlgorithms-DiscontinuousSpaceVectorModulation - SVM Based on Two-level Algorithm **High-Level Diode-Clamped Inverters** - Four- and Five-Level Diode-Clamped Inverters - Carrier-Based PWM– **Other Multilevel Voltage Source Inverters – Introduction - NPC/H-Bridge Inverter - Inverter** Topology - Modulation Scheme - Waveforms and Harmonic Content - **MultilevelFlying-Capacitor Inverters** – Inverter Configuration - Modulation Schemes

UNIT-V PWMCURRENTSOURCE INVERTERS 9

Introduction **-** PWM Current Source Inverter - Trapezoidal Modulation - Selective Harmonic Elimination -**Space Vector Modulation** - Switching States - Space Vectors - DwellTimeCalculation -SwitchingSequence-HarmonicContent - SVM VersusTPWM and SHE - **Parallel Current Source Inverters** - Inverter Topology -Space Vector Modulation for Parallel Inverters - Effect of Medium Vectors on dc Currents - dc Current Balance Control - Load-Commutated Inverter (LCI) **Total: 45**

TEXT/REFERENCEBOOKS:

1. B.Woo,“HighPowerConvertersandACDrives”,JohnWiley&Sons,2006
2. NedMohanet.al,“PowerElectronics” ,JohnWileyandSons,2006
3. Rashid, “Power Electronics, Circuits Devices and Applications”, Pearson Education, 3rd edition, 2004.
4. G.K.Dubey,Thyristorised PowerControllers,WileyEasternLtd,1993.
5. Dewan&Straughen,PowerSemiconductorCircuits, JohnWiley&Sons, 1975.
6. CyrilWLander,PowerElectronics,McGrawHill,3rdedition, 1993.

22153E74AP-POWERSYSTEMTRANSIENTS

3003

SemesterVII

AIM

Tounderstandgenerationofswitchingandlightingtransients,theirpropagation, reflection and refraction a on the grid ad their impact on the grid equipment.

OBJECTIVES

i. Tostudythegenerationofswitchingtransientsandtheircontrolusingcircuit–theoretical concept.
ii. Tostudythemechanismoflighting strokesandtheproductionoflightingsurges.
iii. Tostudythepropagation,reflectionandrefractionoftravellingwaves.
iv. Tostudythe impact ofvoltagetransients caused byfaults, circuit breaker action, load rejection on integrated power system.

UNITI INTRODUCTIONAND SURVEY 7

Varioustypesofpowersystemtransients- effects oftransientsonpowersystems.

UNITII LIGHTNINGANDSWITCHING SURGES 19

Electrification of thunder clouds – lightning current surges, parameters – closing and reclosing of lines – load rejection – fault clearing – short line faults – ferro-resonance – temporary over voltages – harmonics.

UNITIII MODELLINGOFPOWERSYSTEMEQUIPMENT 14

Surge parameters of power systems equipment, equivalent circuit representation, lumped and distributed circuit transients.

UNITIV COMPUTATIONOFTRANSIENTOVERVOLTAGES 14

Computationoftransients–travelingwavemethod,Bewley’slatticediagram–analysis in time and frequency domain, EMTP for transient computation.

UNITV INSULATIONCOORDINATION 12

Insulation co-ordination – over voltage protective devises principles of recent co-ordination and design of EHV lines. **Total = 60**

COURSEOUTCOMES

- Abilitytounderstandandanalyzepowersystemtransientsandtypesofswitching transients.
- Togetknowledgeaboutlighteningtransientsandhighvoltagetransientbehavior travelling on line.
- Togetknowledgeabouttransientsinintegratedpowersystems.

TEXTBOOKS

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. KlausRagaller,'SurgesinHighVoltageNetworks',PlenumPress,NewYork,1980.
2. Diesengrof, W., 'Overvoltages on High Voltage Systems', Rensealer Bookstore, Troy, New York, 1971.

ELECTIVES-IV
SEMESTER-VII

22153E74BP-EHVACandDCTRANSMISSIONSYSTEMS

3003

UNITI TRANSMISSIONENGINEERING 9

Transmission line trends – Standard transmission voltages – Power handling capacity and line losses Cost of transmission lines and equipment – Mechanical consideration – Transmission Engineering principles.

UNITII LINE PARAMETER 9

Calculation of line and ground parameters - Resistance, capacitance and Inductance calculation – Bundle conductors – modes propagation – Effect of earth.

UNITIII 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.

UNITIV EHVACTransmission 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.

UNITV HVDCTRANSMISSION 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

COURSEOUTCOMES

- BasicknowledgeofHVDCTransmission,itscomponents,typesandapplications
- Abilityto analyzeanddesigntheConvertercircuits,SystemControlTechniques
- Abilitytodesignfiltersforharmoniccontrolandperformpowerflowanalysisusing Per unit system for DC Quantities.

Reference Books:

1. RakoshDasBegamudre,'ExtraHVDCTransmissionEngineering',WileyEastern Ltd, 1990.
2. PadiyarK.R.,'HVDCPowerTransmissionsystems',WileyEasternLtd,1993.
3. AllanGreenwood,'ElectricaltransientsinpowerSystems',JohnEasternLtd,New York, 1992.
4. ArrilagaJ.,'HVDCtransmission',PeterPerengrinusLtd,London, 1983.

ELECTIVES-IV
SEMESTER-VII

22153E74CP- FundamentalsofNanoscience 3003

OBJECTIVES:
Tolearnaboutbasisofnanomaterialscience,preparation method,typesand application

UNITIINTRODUCTION 9
Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology andEngineering Classifications of nanostructured materials- nano particles- quantum dots,nanowires-ultra-thin films multilayered materials. Length Scales involved and effect onproperties: Mechanical, Electronic,

UNITII GENERALMETHODSOFPREPARATION9
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication, MechanicalMilling,Colloidalroutes,Self-assembly,Vapour phasedeposition,MOCVD, Sputtering,Evaporation,MolecularBeamEpitaxy,AtomicLayerEpitaxy,MOMBE.

UNITIIINANOMATERIALS 9
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Singlewall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)-methodsof synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-propertyRelationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nano clays functionalizationandapplications-Quantum wires, Quantum dots-preparation, properties and applications..

UNITIVCHARACTERIZATIONTECHNIQUES9
X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques,Transmission Electron Microscopy including high-resolution imaging, Surface Analysistechniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nano indentation.

UNITV APPLICATIONS 9
NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystallinesilverforbacterialinhibition,Nanoparticlesforsunbarrierproducts-In Photostat,printing,solarcell,battery.

L=45Total= 45

COURSEOUTCOMES

- Willfamiliarizeaboutthescienceofnanomaterials
- Willdemonstratethepreparationofnanomaterials
- Willdevelopknowledgeincharacteristicnanomaterial

TEXT BOOKS

1. A.S.EdelsteinandR.C.Cammearata,eds.,“Nanomaterials:Synthesis,Properties andApplications”, InstituteofPhysicsPublishing,BristolandPhiladelphia,1996.

2. NJohnDinardo,“Nanoscalecharecterisationofsurfaces&Interfaces”,2ndedition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCEBOOKS

1. GTimp,“Nanotechnology”,AIPpress/Springer,1999.
2. Akhlesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure, Theory,ModelingandSimulations”.Prentice-HallofIndia(P)Ltd,NewDelhi,2007.

22153E74DP- ADVANCEDCONTROLSYSTEMS 3003

AIM

Togainknowledgeinanalysisofnon-linearsystemanddigitalcontroloflinear system.

OBJECTIVES

i. Tostudythedescriptionandstabilityofnon-linearsystem.
ii. Tostudytheconventionaltechniqueofnon-linearsystemanalysis.
iii. Tostudytheanalysisdiscretetimesystemsusingconventionaltechniques.
iv. Tostudytheanalysisofdigitalcontrolsystemusingstate-space formulation.
v. To studythe formulationand analysisofmulti input multioutput(MIMO) system.

UNITI NON-LINEARSYSTEM–DESCRIPTION&STABILITY 9

Linearvsnon-linear–Examples–IncidentalandIntentional –Mathematical description - Equilibriaandlinearisation-Stability–Lyapunovfunction–ConstructionofLyapunov function.

UNITII PHASEPLANEANDDESCRIBINGFUNCTIONANALYSIS 9

Construction of phase trajectory –Isoclinemethod–Directornumericalintegration– Describing function definition – Computation ofamplitude and frequency of oscillation.

UNITIII Z-TRANSFORMAND DIGITALCONTROL SYSTEM 9

Z transferfunction–Blockdiagram–Signalflowgraph–Discreterootlocus–Bode plot.

UNITIV STATE-SPACEDESIGNOFDIGITALCONTROLSYSTEM 9

Stateequation–Solutions–Realization–Controllability–Observability– Stability Jury's test.

UNITV MUTLIINPUTMULTIOUTPUT(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**

<u>COURSEOUTCOMES</u>

- Developmathematicalmodelsandunderstandthemathematicalrelationships between
- thesensitivityfunctionsandhowtheygovernthefundamentalsincontrol systems.
- DesignandfinetunePID controllersandunderstandtherolesofP,IandDin feedback control and develop state-space models

- Advancedfiltersdesignforvariouscontrolapplicationswithpropererror estimation techniques.

TEXT BOOKS

1. BenjaminC.Kuo,‘DigitalControlSystems’,OxfordUniversityPress,1992.
2. GeorgeJ.Thaler,‘AutomaticControlSystems’,JaicoPublishers,1993.

REFERENCEBOOKS

1. I.J.NagrathandM.Gopal,‘ControlSystemsEngineering’,NewAgeInternational Publishers, 2003.
2. Raymond T. Stefani&Co., ‘Designoffeed back Controlsystems’, Oxford University, 2002.
3. WilliamL.LuybenandMichaelL.Luyben,‘EssentialsofProcessControl’, McGraw Hill International Editions, Chemical Engineering Series, 1997.

22153E74EP SWITCHEDMODEPOWERSUPPLIES 2024

AIM

TostudylowpowerSMPSandUPStechnologies

OBJECTIVE

To provide conceptual knowledge in modern power electronic converters and its applications in electric power utility.

UNIT-I Introduction 9

Linear regulator Vs. Switching regulator – Topologies of SMPS – isolated and non isolated topologies – Buck – Boost – Buck boost – Cuk – Polarity inverting topologies – Push pull and forward converters half bridge and full bridge – Fly back converters Voltage fed and current fed topologies. EMI issues.

UNIT-II DesignConcepts 9

Magnetic Circuits and design – Transformer design - core selection – winding wire selection – temperature rise calculations - Inductor design. Core loss – copper loss – skin effect - proximity effect. Power semiconductor selection and its drive circuit design – snubber circuits. Closing the feedback loop – Control design – stability considerations

UNIT-III Control Modes 9

Voltage Mode Control of SMPS.. Transfer Function and Frequency response of Error Amp. Transconductance Error Amps.PWM Control ICs (SG 3525,TL 494,MC34060 etc.) Current Mode Control and its advantages. Current Mode Vs Voltage Mode. Current Mode PWM Control IC(eg.UC3842).

UNIT-IVApplicationsof SMPS 9

Activefrontend–powerfactor correction–Highfrequency powersourcefor fluorescent lamps - power supplies for portable electronic gadgets.

UNIT-V Resonant converters 9

Principleofoperation–modesofoperation–quasiresonantoperation-advantages.

Total:45

Text/ReferenceBooks:

1. Abraham I Pressman - Switching power supply design – 2nd edition 1998 Mc-Grawhill Publishing Company.
2. Keith H Billings - Switch mode power supply handbook – 1st edition 1989 Mc-Graw hill Publishing Company.
3. SanjayaManiktala -SwitchingpowersuppliesAtoZ.–1stedition2006, ElsevierInc.
4. Daniel M Mitchell : DC-DC Switching Regulator Analysis. McGraw Hill Publishing Company
5. NedMohanet.al:PowerElectronics.JohnWileyandSons.
6. OtmarKilgenstein:SwitchedModePowerSupplies inPractice.JohnWileyandSons.
7. MarkJNave:PowerLineFilterDesignforSwitched-ModePowerSupplies.Van Nostrand Reinhold, New York.

22153P75P ProjectWork

- The student will use their ability to design electrical, electronic systems and signals through modeling, simulation, experimentation, interpretation and analysis to build, test, and debug prototype circuits and systems and analyze results using the principles of design to solve open-ended engineering problems.
- The students will be able to take professional decisions basedon the impactofsocio-economicissuesbytheirself-confidence,ahighdegreeof personal integrity, and the belief that they can each make a difference by developing persuasive communication skills in a variety of media by engaging them in team-based activities, and by strengthening their interpersonal skills. This will lead to develop the leadership qualities by making the students to identify their personal values and demonstrate the practice of ethical leadership.
- The students will be able to appreciate the importance of optimization, commercialization, and innovation as the desired features of the designed system

DEPARTMENTOFELECTRICALANDELECTRONICSENGINEERING

PROGRAMME:M.TECH-POWERSYSTEMS(FULLTIME)CURRICULUM -REGULATION2022

SEMESTER–I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22248S11D	AppliedMathematicsforPowerSystem Engineering	3	1	0	4
2	22272C12	SystemTheory	3	1	0	4
3	22272C13	AdvancedPowerSystemAnalysis	3	1	0	4
4	22272C14	EconomicOperationsofPower Systems	3	1	0	4
5	22272C15	HVDCandFACTS	3	1	0	4
6	22272E16_	Elective-I	3	0	0	3
7	22272L17	PowerSystemSimulation Laboratory	0	0	3	3
		TOTAL				**26**

SEMESTER–II

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C21	EHVpowertransmission	3	1	0	4
2	22272C22	PowerSystemControl	3	1	0	4
3	22272C23	AdvancedPowerSystemProtection	3	1	0	4
4	22272E24_	Elective–II	3	0	0	3
5	22272E25_	Elective–III	3	0	0	3
6	22272L26	AdvancedPowerSystemSimulation Laboratory	0	0	3	3
7	222TECWR	TechnicalWriting/Seminars	0	0	3	3
		TOTAL				**24**

SEMESTER–III

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C31	ElectricalTransientsin power systems	3	1	0	4
2	22272E32_	Elective–IV	3	0	0	3
3	22272E33_	Elective–V	3	0	0	3
4	22272E34_	Elective–VI	3	0	0	3
5	22272P35	ProjectworkPhase-I	0	0	10	10
		TOTAL				**23**

SEMESTER–IV

SL. NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272P41	ProjectworkPhase-II	0	0	15	15

Elective–I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E16A	AnalysisofInverters	3	0	0	3
2.	22272E16B	ModelingandAnalysisofElectrical Machines	3	0	0	3
3.	22272E16C	AdvancedPower SystemDynamics	3	0	0	3
4.	22272E16D	AnalysisandComputationof ElectromagneticTransientsin Power Systems	3	0	0	3

Elective–II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E24A	SmartGrid	3	0	0	3
2.	22272E24B	SolarandEnergy Storage Systems	3	0	0	3
3.	22272E24C	PowerSystem Reliability	3	0	0	3
4.	22272E24D	DistributedGeneration and Microgrid	3	0	0	3

Elective–III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E25A	WindEnergyconversion systems	3	0	0	3
2.	22272E25B	AITechniquestoPower Systems	3	0	0	3
3.	22272E25C	ElectricalDistribution	3	0	0	3
4.	22272E25D	EnergyManagement and Auditing	3	0	0	3

Elective–IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E32A	PowerElectronicsapplicationsinPower systems	3	0	0	3
2.	22272E32B	PowersystemDynamics	3	0	0	3
3.	22272E32C	ElectricVehiclesandPowerManagement	3	0	0	3
4.	22272E32D	ElectromagneticInterferenceand Compatibility	3	0	0	3

Elective–V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E33A	PowerConditioning	3	0	0	3
2.	22272E33B	DeregulatedPowerSystem	3	0	0	3
3.	22272E33C	ControlSystemDesign ForPowerElectronics	3	0	0	3
4.	22272E33D	PrinciplesofEHVTransmission	3	0	0	3

Elective–VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E34A	SoftwareforControlsystem Design	3	0	0	3
2.	22272E34B	IndustrialPowersystem analysis and design	3	0	0	3
3.	22272E34C	SoftComputing Techniques	3	0	0	3
4.	22272E34D	RestructuredPower System	3	0	0	3

TotalCredits= 88

CreditDistribution

Sem.	CoreCourses				Elective Courses		TotalCredits
	Theory Courses		Practical Courses				
	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	04	16	01	03	01	03	26
II	03	12	02	06	02	06	24
III	01	04	-	-	03	09	23
IV	-	-	-	-	-	-	15
						TotalCredits	**88**

HOD **DEAN**

DEANACADEMICAFFAIRS

22248S11D-APPLIEDMATHEMATICS forPOWER SYSTEMENGINEERING

ENGINEERING 3 1 0 4

1. ADVANCEDMATRIXTHEORY 9

Matrixnorms–Jordancanonicalform–Generalizedeigenvectors–Singularvaluedecomposition – Pseudo inverse – Least square approximations.

2. RANDOMPROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson,normalandexponentialdistributionsdensity&distribution Functions-MomentsMomentGeneratingFunctions–Notionofstochasticprocesses-Auto-correlation –Crosscorrelation.

3. LINEARPROGRAMMING 9

Basic concepts – methods –Transportationproblem – GraphicalandSimplexAssignment problem.

4. DYNAMIC PROGRAMMING 9

Elementsofthedynamicprogrammingmodel–optimalityprinciple–Examplesofdynamic programming models and their solutions.

5. INTEGRALTRANSFORMS 9

FiniteFouriertransform-Fourierseries-FinitesineTransform-Cosine transform - finiteHankel transform - definition, Transform of df/dx where p is a rootofJn(p)=0

L=45T=15P=0C=4

REFERENCES

1. Lewis.D.W.,MatrixTheory,AlliedPublishers, Chennai1995.
2. Bronson,R,MatrixOperations,SchaumsoutlineSeries,McGrawHill,NewYork.1989.
3. Andrews,L.A.,andShivamoggiB.K.,“IntegralTransformsforEngineersand Applied Mathematicians”, Macmillan , New York ,1988.
4. Taha, H.A., " Operations research - An Introduction ", Mac Millan publishing Co., (1982).
5. Gupta,P.K.andHira,D.S.,"OperationsResearch",S.Chand&Co.,NewDelhi,(1999).6..
6. Ochi,M.K."AppliedProbabilityandStochasticProcesses",JohnWiley&Sons(1992).
7. PeeblesJr.,P.Z.,"Probability Random VariablesandRandom Signal Principles, McGraw Hill Inc., (1993).

22272C12-SYSTEMTHEORY

3104

1. PHYSICALSYSTEMSANDSTATEASSIGNMENT **9**

Systems-electrical-mechanical-hydraulic-pneumatic-thermalsystems-modellingofsometypical systems like D.C. Machines - inverted pendulum.

2. STATESPACEANALYSIS **9**

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solutionofstateequations - statetransition matrix and itsproperties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMOSYSTEMS-FREQUENCYDOMAINDESCRIPTIONS **9**

Propertiesoftransfer functions - impulse response matrices - polesand zerosoftransfer function matrices - critical frequencies - resonance - steady state and dynamic response - bandwidth - Nyquist plots - singular value analysis.

4. NON-LINEARSYSTEMS **9**

Typesofnon-linearity-typicalexamples-equivalentlinearization-phaseplaneanalysis-limitcycles-describing functions - analysis using describing functions - jump resonance.

5. STABILITY **9**

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov’s method and its extensions.

L=45T=15P=0C=4

REFERENCES

1. M.Gopal,‘ModernControlEngineering’,Wiley,1996.
2. J.S.Bay,‘LinearStateSpaceSystems’,McGraw-Hill,1999.
3. Eroni-UmezandEroni,‘Systemdynamics&Control’,ThomsonBrooks/Cole,1998.
4. K.Ogatta,‘ModernControlEngineering’,PearsonEducation,LowPricedEdition,1997.
5. G.J.Thaler,‘Automaticcontrolsystems’,Jaicopublishers,1993.
6. JohnS.Bay,‘LinearStateSpaceSystems’,McGraw-HillInternationalEdition,1999.

22272C13-ADVANCEDPOWERSYSTEMANALYSIS

3104

OBJECTIVES:

- Tointroducedifferenttechniquesofdealingwithsparsematrixforlargescalepower systems.
- Toimpartin-depthknowledgeondifferentmethodsofpowerflowsolutions.
- Toperformoptimalpowerflowsolutionsindetail.
- Toperformshortcircuitfaultanalysisandunderstandtheconsequenceofdifferenttype of faults.
- ToIllustratedifferentnumericalintegrationmethodsandfactorsinfluencing transient stability

UNITI SOLUTIONTECHNIQUE 9

SparseMatrixtechniques for largescalepowersystems:Optimalorderingschemes forpreserving sparsity. Flexible packed storage scheme for storing matrix as compact arrays –Factorization by BifactorizationandGauss eliminationmethods;Repeat solutionusing LeftandRight factorsandL and U matrices.

UNITII POWERFLOWANALYSIS 9

Power flow equation in real and polar forms; Review of Newton's method for solution; AdjustmentofP-Vbuses;ReviewofFastDecoupledPowerFlowmethod;SensitivityfactorsforP-V bus adjustment..

UNITIII OPTIMALPOWERFLOW 9

Problem statement; Solution of Optimal Power Flow (OPF) – The gradient method, Newton's method, Linear Sensitivity Analysis; LP methods – With realpower variables only – LP method with AC power flow variables and detailed cost functions; Security constrained Optimal Power Flow; Interior point algorithm; Bus Incremental costs.

UNITIV SHORTCIRCUITANALYSIS 9

Formation of bus impedance matrix with mutual coupling (single phase basis and three phase basis)- Computermethodforfault analysisusingZBUSandsequencecomponents. Derivationof equations for bus voltages, fault current and line currents, both in sequence and phase – symmetrical and unsymmetrical faults.

UNITV TRANSIENTSTABILITYANALYSIS 9

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classical synchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

L=45T=15P=0C=4

OUTCOMES:

- Abilitytoapplytheconceptsofsparsematrixforlargescalepowersystemanalysis
- Abilitytoanalyzepowersystemstudiesthatneededforthetransmission systemplanning.

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1. A.J.WoodandB.F.Wollenberg,“PowerGenerationOperationandControl”,JohnWileyand sons, New York, 1996.
2. W.F.Tinneyand W.S.Meyer,“SolutionofLargeSparseSystembyOrderedTriangular Factorization”IEEETrans.onAutomaticControl,Vol:AC-18,pp:333346Aug1973.
3. K.Zollenkopf, “Bi-Factorization: Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on “Large Sparse Set of Linear Systems” Editor: J.K.Rerd,Academic Press, 1971.
4. M.A.Pai,”ComputerTechniquesinPowerSystemAnalysis”,TataMcGraw-HillPublishing Company Limited, New Delhi, 2006.
5. GWStagg,A.HEl.Abiad,“ComputerMethodsinPowerSystemAnalysis”,McGrawHill,1968.
6. P.Kundur,“PowerSystemStabilityandControl”,McGrawHill,1994.

22272C14-ECONOMICOPERATIONSOFPOWERSYSTEMS

3104

1. INTRODUCTION 9

Planning and operational problems of power systems – review of economic dispatch and calculationusing B matrix loss formula – use ofparticipation factorsinon line economic dispatch.

2. OPTIMALPOWERFLOW 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. HYDROTHERMAL SCHEDULING 9

Problems definition and mathematical model of long and short term problems – discretization – dynamic and incremental dynamic programming – methods of local variation – hydro thermal systemwith pumped hydro units – solution by local variation treating pumped hydro unit for load management and spinning reserve.

4. UNITCOMMITMENT 9

Constraints inunit commitment – solution byprioritylist method –dynamic programming method – backward and forward – restricted search range.

5. MAINTENANCESCHEDULING 9

Factorsconsideredinmaintenanceschedulingforgeneratingunits–turbines–boilers– introduction to maintenance scheduling using mathematical programming.

L=45T=15P=0C=4

REFERENCES

1. AllenJ.WoodandBruceF.Wollenberg,"Powergenerationandcontrol",JohnWiley& Sons, New York, 1984.
2. KrichmayerL.,"Economicoperationofpowersystems",JohnWileyandsonsInc,NewYork, 1958.
3. KrichmayerL.K,"EconomiccontrolofInterconnectedsystems",JhonWileyandsonsInc,New York, 1959.
4. ElgerdO.I.,"Electricenergysystemstheory–anintroduction",McGrawHill,NewDelhi,1971.

22272C15-HVDCANDFACTS

3104

OBJECTIVES:

- ToemphasistheneedforFACTScontrollers.
- Tolearnthecharacteristics,applicationsandmodelingofseriesandcontrollers.
- ToanalyzetheinteractionofdifferentFACTScontrollerandcoordination
- Toimpartknowledgeonoperation,modellingandcontrolofHVDClink.
- ToperformsteadystateanalysisofAC/DCsystem.

UNITI INTRODUCTION 9

Review of basics of power transmission networks-control of power flow in ACtransmissionline- Analysis of uncompensated AC Transmission line- Passive reactive power compensation: Effect ofseries andshunt compensationatthemid-pointofthelineon powertransfer-NeedforFACTS controllers- types of FACTS controllers. Comparison of AC & DC Transmission, Applicationsof DC Transmission Topologies.

UNITIISVC&STATCOM 9

Configuration of SVC- voltage regulation by SVC- Modelling of SVC for load flow analysisDesign of SVC to regulate the mid-point voltage of a SMIB system- Applications Static synchronous compensator(STATCOM)- Operation of STATCOM – Voltage regulation – Power flow control with STATCOM.

UNITIIITCSCandSSSC 9

ConceptsofControlledSeriesCompensation-OperationofTCSC-AnalysisofTCSCoperation - Modelling of TCSC for load flow studies - Static synchronous series compensator (SSSC)- Operation of SSSC - Modelling of SSSC for power flow – operation of Unified power flow controllers(UPFC).

UNITIVANALYSISOFHVDCLINK 9

Simplified analysis of six pulse Graetz bridge – Charecteristics -Analysis of converteroperations–Commutationoverlap–EquivalencecircuitofbipolarDCtransmissionlink–Modesofoperation–Modeambiguity–Differentfiringanglecontrollers–Powerflowcontrol.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Perunit systemforDCQuantities - ModellingofDC links- SolutionofDC loadflow - Solution of AC-DC power flow – Unified and Sequential methods.

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillbeabletorefreshonbasicsofpowertransmissionnetworksandneed forFACTS controllers
- Learnerswillunderstandthesignificanceaboutdifferentvoltagesourceconverterbased FACTS controllers
- LearnerswillunderstandthesignificanceofHVDCconvertersand HVDCsystemcontrol
- LearnerswillattainknowledgeonAC/DCpowerflowanalysis

REFERENCES

1. MohanMathur,R.,Rajiv.K.Varma,“Thyristor–BasedFactsControllersforElectrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.

2. K.R.Padiyar,“FACTSControllersinPowerTransmissionandDistribution”,NewAge International (P) Ltd., Publishers, New Delhi, Reprint 2008.
3. K.R.Padiyar,“HVDCPowerTransmissionSystems”,NewAgeInternational(P)Ltd.,New Delhi, 2002.
4. J.Arrillaga,“HighVoltageDirectCurrentTransmission”,PeterPregrinus,London,1983.
5. V.K.Sood,“HVDCandFACTScontrollers-ApplicationsofStaticConvertersinPower System”, Kluwer Academic Publishers 2004

22272L17-POWERSYSTEMSIMULATIONLABORATORY 0033

OBJECTIVES:

- Tohavehandsonexperienceonvarioussystemstudiesanddifferenttechniquesused
- forsystemplanningusingSoftwarepackages
- Toperformthedynamicanalysisofpowersystem
-

LISTOFEXPERIMENTS

1. PowerflowanalysisbyNewton-RaphsonmethodandFastdecoupledmethod

2. Transientstabilityanalysisofsinglemachine-infinitebussystemusingclassicalmachine model

3. Contingencyanalysis:Generatorshiftfactorsandlineoutagedistributionfactors

4. Economicdispatchusinglambda-iterationmethod

5. Unitcommitment:Priority-listschemesanddynamicprogramming

6. StateEstimation(DC)

7. AnalysisofswitchingsurgeusingEMTP:Energisationofalongdistributed-parameterline

8. AnalysisofswitchingsurgeusingEMTP: Computationoftransientrecoveryvoltage

9. Simulationand ImplementationofVoltageSourceInverter

10. DigitalOverCurrentRelaySettingandRelayCoordinationusingSuitablesoftwarepackages11

Co-ordination of over-current and distance relays for radial line protection

TOTAL: 60PERIODS

OUTCOMES:

- UponCompletionofthecourse,thestudentswillbeableto:
- AnalyzethepowerflowusingNewton-RaphsonmethodandFastdecoupledmethod.
- Performcontingencyanalysis&economicdispatch
- SetDigitalOverCurrentRelayandCoordinateRelay

22272C21-EHV POWERTRANSMISSION

3104

1. INTRODUCTION 9

Standard transmission voltages – different configurations of EHV and UHV lines – average valuesofline parameters – power handling capacityand line loss – costsoftransmission lines and equipment – mechanical considerations in line performance.

2. CALCULATIONOFLINEPARAMETERS 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 ofground return, numericalexample involving a typical 400/220kV line using line constant program.

3. VOLTAGEGRADIENTSOFCONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use– distribution of voltage gradient on sub conductorsof bundle - voltage gradients on conductors in the presence of ground wires on towers.

4. CORONAEFFECTS 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. ELECTROSTATICFIELDOFEHVLINES 9

Effect ofEHVlineon heavy vehicles-calculation ofelectrostaticfield ofAC lines-effect of high field on humans, animals, and plants - measurement of electrostatic fields - electrostatic Induction inunenergised circuit ofa D/Cline - induced voltages in insulated ground wires - electromagnetic interference

L=45T=15P=0C=4

REFERENCES

1. RakoshDasBegamudre,“ExtraHighVoltageACTransmissionEngineering”,Second Edition, New Age International Pvt. Ltd., 1990.
2. PowerEngineer’sHandbook,RevisedandEnlarged6thEdition,TNEBEngineers’ Association,October 2002.
3. MicrotranPowerSystemAnalysisCorporation,MicrotranReferenceManual,VancouverCanada. (Website: www.microtran.com).

22272C22 **POWERSYSTEMCONTROL** **3104**

1. AUTOMATICGENERATIONCONTROL **9**

Plant and system level controlproblem – 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. AUTOMATICVOLTAGECONTROL **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. SECURITYCONTROLCONCEPT **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. STATEESTIMATION **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. COMPUTERCONTROLOFPOWERSYSTEM **9**

Energy control center – various levels – national – regional and state level SCADA system – computer configuration – functions, monitoring, data acquisition and controls – EMS system–softwareinEMSsystem.Expertsystemapplicationsforpowersystemoperation.

L =45T =15P=0C=4

REFERENCES

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3. TaylorC.W.,"powersystemsvoltagestability",McGrawHill,NewDelhi,1993.
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5. KimbarkE.W.,"powersystemstability",Vol.3.,Synchronousmachines,JohnWileyandsons, 1956.
6. T.VCustem,C.Vournas,"voltagestabilityofpowersystem",KluwerAcadamicPublishers,1998.
7. ElgerdO.L.,"Elctricenergysystemstheory–anintroduction",McGrawHill,NewDelhi,1971.

22272C23-ADVANCEDPOWERSYSTEMPROTECTION

3104

OBJECTIVES:

- Toillustrateconceptsoftransformerprotection
- TodescribeaboutthevariousschemesofOvercurrentprotection
- Toanalyzedistanceandcarrierprotection
- TofamiliarizetheconceptsofGeneratorprotectionandNumericalprotection

UNITI OVERCURRENT&EARTHFAULTPROTECTION 9

Zones of protection – Primary and Backup protection – operating principles and Relay Construction - Time – Current characteristics-Current setting – Time setting-Over current protective schemes –Concept of Coordination - Protection of parallel / ring feeders – Reverse power or directional relay –Polarisation Techniques – Cross Polarisation – Quadrature Connection -Earth fault and phase fault protection - Combined Earth fault and phase fault protection scheme - Phase fault protective - scheme directional earth fault relay - Static over current relays–Numericalover –current protection;numericalcoordinationexample foraradial feeder

UNITII TRANSFORMER&BUSBARPROTECTION 9

Types of transformers –Types of faults in transformers- Types of Differential Protection – High Impedance – External fault with one CT saturation – Actual behaviors of a protective CT – Circuit model of a saturated CT - Need for high impedance – Disadvantages - Percentage Differential Bias Characteristics – Vector group & its impact on differential protection - Inrush phenomenon – Zero Sequence filtering – High resistance Ground Faults in Transformers – Restricted Earth fault Protection - Inter-turn faults in transformers – Incipient faults in transformers - Phenomenon of overfluxing in transformers – Transformer protection application chart.Differentialprotectionofbusbarsexternalandinternalfault-Supervisoryrelay-protectionof three – Phase busbars – Numerical examples on design of high impedance busbar differential scheme – Biased Differential Characteristics – Comparison between Transformer differential & Busbar differential.

UNITIII DISTANCEANDCARRIERPROTECTIONOFTRANSMISSION LINES 9

Drawbackofover –Currentprotection–Introductionto distancerelay–Simple impedancerelay – Reactance relay – mho relays comparison of distance relay – Distance protection of a three – Phase line-reasons for inaccuracyofdistancerelayreach - ThreesteppeddistanceprotectionTrip contact configuration for the three - Stepped distance protection - Three-stepped protection f three-phase line against all ten shunt faults - Impedance seen from relay side - Three-stepped protection of double end fed lines-need for carrier – Aided protection – Various options for a carrier –Coupling and trapping the carrier into the desired line section - Unit type carrier aided directional comparison relaying – Carrier aided distance schemes for acceleration of zone II; numerical example for a typical distance protection scheme for a transmission line.

UNITIV GENERATOR PROTECTION 9

Electrical circuit of the generator –Various faults and abnormal operating conditions – Stator Winding Faults – Protection against Stator (earth) faults – third harmonic voltage protection – Rotor fault – Abnormal operating conditions - Protection against Rotor faults – Potentiometer Method – injection method – Pole slipping – Loss of excitation – Protection against Mechanical faults; Numerical examples for typical generator protection schemes

UNITVNUMERICALPROTECTION

Introduction–Blockdiagramofnumericalrelay- Samplingtheorem- Correlationwithareference (LES) technique-Digital filtering-numerical over - Current protection– Numerical transformer differential protection-Numerical distance protection of transmission line

L=45T=15P=0C=4

OUTCOMES:

- LearnerswillbeabletounderstandthevariousschemesavailableinTransformer
- protection
- LearnerswillhaveknowledgeonOvercurrentprotection.
- LearnerswillattainknowledgeaboutDistanceandCarrierprotectionintransmissionlines.
- LearnerswillunderstandtheconceptsofGeneratorprotection.
- Learnerswillattainbasicknowledgeonsubstationautomation.

REFERENCES

1 Y.G.PaithankarandS.RBhide,“FundamentalsofPowerSystemProtection”,Prentice-Hall of India, 2003

2 BadriRamandD.N.Vishwakarma,“PowerSystemProtectionandSwitchgear”,Tata McGraw- Hill Publishing Company, 2002.

3 T.S.M.Rao,“DigitalRelay/Numericalrelays”,TataMcGrawHill,NewDelhi,1989.

4 P.Kundur,“PowerSystemStabilityandControl”,McGraw-Hill,1993.

22272L26ADVANCEDPOWERSYSTEMSIMULATIONLABORATORY

LTPC

0 0 4 2

OBJECTIVES:

- ToanalyzetheeffectofFACTScontrollersbyperformingsteadystate analysis.
- Tohavehandsonexperienceondifferentwindenergyconversiontechnologies

LISTOFEXPERIMENTS

1. Small-signalstabilityanalysisofsinglemachine-infinitebussystemusingclassical machine model
2. Small-signalstabilityanalysisofmulti-machineconfigurationwithclassicalmachine model
3. Inductionmotorstartinganalysis
4. Loadflowanalysisoftwo-bussystemwithSTATCOM
5. Transientanalysisoftwo-bussystemwithSTATCOM
6. AvailableTransferCapabilitycalculationusinganexistingloadflowprogram
7. Studyofvariablespeedwindenergyconversionsystem-DFIG
8. Studyofvariablespeedwindenergyconversionsystem-PMSG
9. ComputationofharmonicindicesgeneratedbyarectifierfeedingaR-Lload
10. Designofactivefilterformitigatingharmonics

22272C31-ELECTRICALTRANSIENTSINPOWERSYSTEMS

3104

1. TRAVELLINGWAVESONTRANSMISSIONLINE 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. COMPUTATIONOFPOWERSYSTEMTRANSIENTS 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,SWITCHINGANDTEMPORARYOVERVOLTAGES 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 – VeryFast Transient Overvoltage (VFTO)

4. BEHAVIOUROFWINDINGUNDERTRANSIENTCONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior ofthe transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATIONCO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L=45T =15P=0C=4

REFERENCES

1. PritindraChowdhari,“ElectromagnetictransientsinPowerSystem”,JohnWileyandSonsInc., 1996.
2. AllanGreenwood,“ElectricalTransientsinPowerSystem”,Wiley&SonsInc.NewYork, 1991.
3. KlausRagaller,“SurgesinHighVoltageNetworks”,PlenumPress,NewYork,1980.
4. RakoshDasBegamudre,“ExtraHighVoltageACTransmissionEngineering”,(Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. NaiduMSandKamarajuV,“HighVoltageEngineering”,TataMcGraw-HillPublishingCompany Ltd., New Delhi, 2004.
6. IEEEGuideforsafetyinACsubstationgroundingIEEEStandard80-2000.
7. WorkingGroup33/13-09(1988),‘VeryfasttransientphenomenaassociatedwithGas Insulated System’, CIGRE, 33-13, pp. 1-2

22272E16A– ANALYSISofINVERTERS L T PC
3003

OBJECTIVES:

- Todeterminetheoperationandcharacteristicsofcontrolledrectifiers.
- ToapplyswitchingtechniquesandbasictopologiesofDC-DCswitchingregulators.
- Tointroducethedesignofpowerconvertercomponents.
- Toprovideanindepthknowledgeaboutresonant converters.
- TocomprehendtheconceptsofAC-ACpowerconvertersandtheirapplications.

UNITI SINGLEPHASE&THREEPHASECONVERTERS 9

Principle of phase controlled converter operation – single-phase full converter and semi-converter (RL,RLE load)-single phase dualconverter –Three phase operation fullconverter and semi-converter (R,RL,RLE load) – reactive power – power factor improvement techniques – PWM rectifiers.

UNITII DC-DCCONVERTERS 9

Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk& SEPIC –undercontinuous and discontinuous operation – Isolated converters: basic operation of Flyback, Forward andPush-pull topologies.

UNITIII DESIGNOFPOWERCONVERTERCOMPONENTS 9

Introduction to magnetic materials- hard and soft magnetic materials –types of cores , copper windings – Design of transformer –Inductor design equations –Examples of inductor design for buck/flyback converter-selection of output filter capacitors – selection of ratings for devices – input filter design.

UNITIV RESONANTDC-DCCONVERTERS 9

Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters-loadresonant converters–seriesandparallel –resonantswitch converters–operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS-Introduction to ZVT/ZCT PWM converters.

UNITV AC-ACCONVERTERS 9

Principle ofon-offand phase angle control– single phase ac voltage controller – analysis withR & RL load – Three phase ac voltage controller– principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

TOTAL:45PERIODS

OUTCOMES:

Attheend ofthecoursethestudentwillbeableto:

- Analyzevarioussinglephaseandthreephasepowerconverters
- Selectanddesigndc-dcconvertertopologiesforabroadrangeofpowerconversionapplications.
- Developimprovedpowerconvertersforanystringentapplicationrequirements.
- Designac-acconvertersforvariablefrequencyapplications.

TEXTBOOKS:

1 NedMohan,T.MUndelandandW.PRobbin,"PowerElectronics:converters,Application and design" John Wiley and sons.Wiley India edition, 2006.

2 RashidM.H.,"PowerElectronicsCircuits,DevicesandApplications",PrenticeHallIndia, Third Edition, New Delhi, 2004.

3 P.C.Sen,"ModernPowerElectronics",WheelerPublishingCo,FirstEdition,New Delhi, 1998.

4 P.S.Bimbra,"PowerElectronics",KhannaPublishers,EleventhEdition,2003

5 SimonAng,AlejandroOliva,"Power-SwitchingConverters,SecondEdition,CRCPress, Taylor & Francis Group, 2010

6 V.Ramanarayanan,"CoursematerialonSwitchedmodepowerconversion",2007

7 Alex Van den Bossche and VencislavCekovValchev, "Inductors and TransformersforPowerElectronics", CRC Press, Taylor & Francis Group, 2005

8 W.G.HurleyandW.H.Wolfle,"TransformersandInductorsforPowerElectronicsTheory, Design and Applications", 2013 John Wiley & Sons Ltd.

9 Marian.K.KazimierczukandDariuszCzarkowski,"ResonantPowerConverters",John Wiley & Sons limited, 2011

22272E16B-MODELLINGANDANALYSISOFELECTRICALMACHINES

3104

UNITIPRINCIPLESOFELECTROMAGNETICENERGYCONVERSION

Generalexpressionofstoredmagneticenergy-co-energyandforce/torque-exampleusingsingleand doubly excited system.

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UNITIIBASICCONCEPTSOFROTATINGMACHINES

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.

UNITIIIINTRODUCTIONTOREFERENCEFRAMETHEORY

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 - derivationofsteadystatephasorrelationshipfromdynamicmodel -generalizedtheoryofrotating electrical machine and Kron's primitive machine.

UNITIVDETERMINATIONOFSYNCHRONOUSMACHINEDYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamicmodelingoftwophaseasymmetricalinductionmachineandsinglephaseinduction machine.

UNITVSPECIALMACHINES

Permanent magnet synchronousmachine-surface permanent magnet (squareandsinusoidalback E.M.F. type) and interior permanent magnet machines - construction andoperating principle - dynamic modeling and self controlled operation - analysis of switchreluctance motors.

L=45T=15P=0C=4

TEXTBOOKS

1. CharlesKingsley,A.E.FitzgeraldJr.andStephenD.Umans,'ElectricMachinery',Tata McGraw-Hill, Fifth Edition, 1992.

2. R.Krishnan,'ElectricMotor&Drives:Modelling,AnalysisandControl',PrenticeHallofIndia, 2001.

REFERENCES

1. C.V.Jones,'TheUnifiedTheoryofElectricalMachines',Butterworth,1967.

2. T.J.E.Miller,'BrushlessPermanentMagnetandReluctanceMotorDrives'Clarendon Press, 1989.

22272E16CADVANCEDPOWERSYSTEMDYNAMICS LTPC

OBJECTIVES: 3003

- Toperformtransientstabilityanalysisusingunifiedalgorithm.
- Toimpartknowledgeonsub-synchronousresonanceandoscillations
- Toanalyzevoltagestabilityprobleminpowersystem.
- Tofamiliarizethemethodsoftransientstabilityenhancement

UNITITRANSIENTSTABILITYANALYSIS 9

Review of numerical integration methods: Euler and Fourth Order Runge-Kutta methods, Numerical stability and implicit methods, Interfacing of Synchronous machine (variable voltage) model to the transient stability algorithm (TSA) with partitioned – explicit and implicit approaches – Interfacing SVC with TSA-methods to enhance transient stability

UNITII UNIFIEDALGORITHMFORDYNAMICANALYSISOFPOWERSYSTEMS 9

Need for unified algorithm- numerical integration algorithmic steps-truncation error-variable step size – handling the discontinuities- numerical stability- application of the algorithm for transient. Mid-term and long-term stability simulations

UNITIII SUBSYSNCHRONOUSRESONANCE(SSR)ANDOSCILLATIONS 9

Sub synchronous Resonance (SSR) – Types of SSR - Characteristics of series –Compensated transmission systems –Modeling of turbine-generator-transmission network- Self-excitation due to induction generator effect – Torsional interaction resulting in SSR – Methods of analyzing SSR – Numerical examples illustrating instability of subsynchronous oscillations – time-domain simulation of subsynchronous resonance – EMTP with detailed synchronous machine model- Turbine Generator Torsional Characteristics: Shaft system model – Examples of torsional characteristics – Torsional Interaction with Power System Controls: Interaction withgeneratorexcitationcontrols –Interactionwithspeed governors – Interaction with nearby DC converters

UNIT IV TRANSMISSION, GENERATION AND LOAD ASPECTS OF VOLTAGE STABILITY ANALYSIS 9

Review of transmission aspects – Generation Aspects: Review of synchronous machine theory – Voltage and frequency controllers – Limiting devices affecting voltage stability – Voltage-reactive power characteristics of synchronous generators – Capability curves – Effect of machine limitation on deliverable power – Load Aspects – Voltage dependence of loads – Load restoration dynamics – Induction motors – Load tap changers – Thermostatic load recovery – General aggregate load models.

UNIT V ENHANCEMENTOFTRANSIENTSTABILITYANDCOUNTERMEASURESFOR SUB SYNCHRONOUS RESONANCE 9

Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving, high-speed excitation systems; NGH damper scheme.

TOTAL: 45 PERIODS

OUTCOMES:

- Learnerswillbeabletounderstandthevariousschemesavailablein Transformerprotection
- LearnerswillhaveknowledgeonOvercurrentprotection.
- LearnerswillattainknowledgeaboutDistanceandCarrierprotectionin transmission lines.
- LearnerswillunderstandtheconceptsofBusbarprotection.
- Learnerswillattainbasicknowledgeonnumericalprotectiontechniques

REFERENCES

1 R.Ramnujam,"PowerSystemDynamicsAnalysisandSimulation",PHILearning PrivateLimited,NewDelhi,2009

2 T.V.CutsemandC.Vournas,"VoltageStabilityofElectricPowerSystems",Kluwer publishers,1998

3 P.Kundur,"PowerSystemStabilityandControl",McGraw-Hill,1993.

4 H.W. Dommel and N.Sato, "Fast Transient Stability Solutions," IEEE Trans., Vol. PAS-91, pp, 1643-1650, July/August 1972.

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6 M.Stubbe, A.Bihain,J.Deuse, J.C.Baader, "A New Unified software program for the studyofthedynamic behaviourofelectrical power system" IEEETransaction,Power Systems, Vol.4.No.1,Feb:1989 Pg.129 to 138

22272E16D **ANALYSIS AND COMPUTATION OF ELECTROMAGNETICTRANSIENTSINPOWERSYSTEMS**

LTPC
OBJECTIVES: **3003**

- Tounderstandthevarioustypesoftransientsanditsanalysisinpowersystem.
- Tolearnaboutmodelingandcomputationalaspectstransientscomputation

UNITI REVIEWOFTRAVELLINGWAVEPHENOMENA 9
Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction,Behaviourof Travelling waves at the line terminations – Lattice Diagrams – Attenuation andDistortion.

UNITII LIGHTNING,SWITCHINGANDTEMPORARYOVERVOLTAGES 9
Lightning overvoltages: interaction between lightning and power system- ground wire voltage and voltage across insulator; switching overvoltage: Short line or kilometric fault, energizing transients - closing and re-closing of lines, methods of control; temporary overvoltages: line dropping, load rejection; voltage induced by fault; very fast transient overvoltage (VFTO).

UNITIII PARAMETERSANDMODELINGOFOVERHEADLINES 9
Review of line parameters for simple configurations: series resistance, inductance and shunt capacitance; bundle conductors : equivalent GMR and equivalent radius; modal propagation in transmission lines: modes on multi-phase transposed transmission lines, α-β-0 transformation and symmetrical components transformation, modal impedances; analysis of modes on untransposed lines; effect of ground return and skin effect; transposition schemes;

UNITV FASTTRANSIENTSPHENOMENONINAISANDGIS 9
Digital computation of line parameters: why line parameter evaluation programs? Salient features of a typical line parameter evaluation program; constructional features of that affect transmission line parameters; line parameters for physical and equivalent phase conductors elimination of ground wires bundling of conductors; principle of digital computationoftransients:features and capabilitiesofelectromagnetic transientsprogram; steady state and time step solution modules: basic solution methods; case studies on simulation of various types of transients

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillbeabletomodeloverheadlines,cablesandtransformers.
- Learnerswillbeabletoanalyzepowersystemtransients.

REFERENCES

1 AllanGreenwood,“ElectricalTransientsinPowerSystem”,Wiley&SonsInc.NewYork, 1991.
2 R.Ramanujam,“ComputationalElectromagneticTransients:Modeling,SolutionMethodsand Simulation”, I.K. International Publishing House Pvt. Ltd, New Delhi, 2014.
3 NaiduMSandKamarajuV,“HighVoltageEngineering”,TataMcGraw-HillPublishing Company Ltd., New Delhi, 2004.

22272E24A SMARTGRID LTPC

3003

OBJECTIVES:

- ToStudyaboutSmartGridtechnologies,differentsmartmetersandadvanced metering infrastructure.
- TofamiliarizethepowerqualitymanagementissuesinSmartGrid.
- TofamiliarizethehighperformancecomputingforSmartGridapplications

UNITIINTRODUCTIONTOSMARTGRID 9

Evolutionof Electric Grid, Concept, Definitionsand Need for SmartGrid,Smart griddrivers, functions,opportunities,challengesand benefits,Differencebetween conventional &Smart Grid, National and International Initiatives in Smart Grid.

UNITII SMARTGRIDTECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNITIII SMARTMETERSANDADVANCEDMETERINGINFRASTRUCTURE 9

IntroductiontoSmartMeters,AdvancedMeteringinfrastructure(AMI)driversandbenefits, AMI protocols, standards and initiatives, AMIneeds in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices (IED) & their application for monitoring &protection.

UNITIV POWERQUALITYMANAGEMENTINSMARTGRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNITV HIGHPERFORMANCECOMPUTINGFORSMARTGRID APPLICATIONS 9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL:45 PERIODS

OUTCOMES:

- Learnerswilldevelopmoreunderstandingontheconceptsof SmartGridandits present developments.
- LearnerswillstudyaboutdifferentSmartGridtechnologies.
- Learnerswillacquireknowledgeaboutdifferentsmartmetersandadvanced metering infrastructure.
- LearnerswillhaveknowledgeonpowerqualitymanagementinSmartGrids
- LearnerswilldevelopmoreunderstandingonLAN,WANandCloud Computing for Smart Grid application

REFERENCES

1 StuartBorlase“SmartGrid:Infrastructure,TechnologyandSolutions”,CRCPress2012.

2 JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama, “SmartGrid:TechnologyandApplications”,Wiley2012.

3 VehbiC.Güngör,DilanSahin,TaskinKocak,SalihErgüt,ConcettinaBuccella,Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication TechnologiesandStandards”IEEETransactionsOnIndustrialInformatics,Vol.7,No. 4,November2011.

4 XiFang,SatyajayantMisra,GuoliangXue,andDejunYang “SmartGrid–TheNew andImprovedPowerGrid:ASurvey”,IEEETransactiononSmartGrids,vol.14,2012.

22272E24B SOLARANDENERGYSTORAGESYSTEMS LTPC

3003

OBJECTIVES:

- ToStudyaboutsolarmodulesandPVsystemdesignandtheirapplications
- ToDealwithgridconnectedPVsystems
- ToDiscussaboutdifferentenergystoragesystems

UNITIINTRODUCTION 9

Characteristicsofsunlight–semiconductorsandP-Njunctions–behaviorofsolarcells–cell properties – PV cell interconnection

UNITII STANDALONEPVSYSTEM 9

Solarmodules–storagesystems–powerconditioningandregulation-MPPT-protection– stand alone PV systems design – sizing

UNITIII GRIDCONNECTEDPVSYSTEMS 9

PVsystemsinbuildings–designissuesforcentralpowerstations–safety–Economicaspect–Efficiencyandperformance-InternationalPVprograms

UNITIV ENERGYSTORAGESYSTEMS 9

Impactofintermittentgeneration –Batteryenergystorage–solarthermalenergystorage– pumped hydroelectric energy storage

UNITV APPLICATIONS 9

Waterpumping–batterychargers–solarcar–direct-driveapplications–Space–Telecommunications.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldevelopmoreunderstandingonsolarenergystoragesystems
- StudentswilldevelopbasicknowledgeonstandalonePVsystem
- StudentswillunderstandtheissuesingridconnectedPVsystems
- Studentswillstudyaboutthemodelingofdifferentenergystoragesystemsand their performances
- Studentswillattainmoreondifferentapplicationsofsolarenergy

REFERENCES

1 SolankiC.S.,“SolarPhotovoltaics:Fundamentals,TechnologiesAndApplications”,PHI LearningPvt.Ltd.,2015.

2 Stuart R.Wenham, Martin A.Green, Muriel E. Watt and Richard Corkish, “Applied Photovoltaics”, 2007,Earthscan, UK. Eduardo Lorenzo G. Araujo, “Solar electricity engineering of photovoltaicsystems”, Progensa,1994.

3 FrankS.Barnes&JonahG.Levine,“LargeEnergystorageSystemsHandbook”,CRC Press,2011.

4 McNeils,Frenkel,Desai,“Solar&WindEnergyTechnologies”,WileyEastern, 1990

5 S.P.Sukhatme,“SolarEnergy”,TataMcGrawHill,1987.

22272E24C POWERSYSTEMRELIABILITY LTPC

OBJECTIVES: 3003

- Tointroducestheobjectivesof Loadforecasting.
- Tostudythefundamentalsof Generationsystem,transmissionsystemand Distribution system reliability analysis
- Toillustratethebasicconceptsof Expansionplanning

UNITI LOADFORECASTING 9

Objectivesofforecasting -Loadgrowthpatternsandtheirimportanceinplanning -Load forecastingBasedondiscountedmultipleregressiontechnique-Weathersensitiveload forecasting-Determination of annual forecasting-Use of AI in load forecasting.

UNITII GENERATIONSYSTEMRELIABILITYANALYSIS 9

Probabilisticgenerationandloadmodels-DeterminationofLOLPandexpectedvalueofdemand not served –Determination of reliability of ISO and interconnected generation systems

UNITIII TRANSMISSIONSYSTEMRELIABILITYANALYSIS 9

Deterministiccontingencyanalysis-probabilisticloadflow-Fuzzyloadflowprobabilistic transmissionsystemreliabilityanalysis-DeterminationofreliabilityindiceslikeLOLPand expected value of demand not served

UNITIV EXPANSIONPLANNING 9

Basicconceptsonexpansionplanning-procedurefollowedforintegratetransmission systemplanning,currentpracticeinIndia-Capacitorplacerprobleminttransmission system and radial distributions system.

UNITV DISTRIBUTIONSYSTEMPLANNINGOVERVIEW 9

Introduction,subtransmissionlinesanddistributionsubstations-Designprimaryand secondarysystems-distributionsystemprotectionandcoordinationofprotectivedevices.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldeveloptheabilitytolearnaboutloadforecasting.
- StudentswilllearnaboutreliabilityanalysisofISOandinterconnectedsystems.
- StudentswillunderstandtheconceptsotContingencyanalysisandProbabilistic Load flow Analysis
- StudentswillbeabletounderstandtheconceptsofExpansionplanning
- StudentswillhaveknowledgeonthefundamentalconceptsoftheDistribution system planning

REFERENCES

1 RoyBillinton&RonaldN.Allan,“ReliabilityEvaluationofPowerSystems”Springer Publication,

2 R.L.Sullivan,“PowerSystemPlanning”,TataMcGrawHillPublishingCompanyLtd 1977.

3 X.Wang&J.R.McDonald,“ModernPowerSystemPlanning”,McGrawHillBook Company1994.

4 T.Gonen,“ElectricalPowerDistributionEngineering”,McGrawHillBookCompany 1986.

5 B.R.Gupta,“GenerationofElectricalEnergy”,S.ChandPublications1983.

22272E24D DISTRIBUTEDGENERATIONANDMICROGRID **LTPC**

OBJECTIVES: **3003**

- Toillustratetheconceptofdistributedgeneration
- Toanalyzetheimpactofgridintegration.
- TostudyconceptofMicrogridanditsconfiguration

UNITI INTRODUCTION 9

Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNITII DISTRIBUTEDGENERATIONS(DG) 9

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework,Standardsfor interconnecting Distributed resourcesto electric power systems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

UNITIII IMPACTOFGRIDINTEGRATION 9

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency,THD,responsetogridabnormaloperatingconditions,islandingissues.Impactof grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNITIV BASICSOFAMICROGRID 9

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids,typicalstructureandconfigurationofamicrogrid,ACandDCmicrogrids,Power Electronics interfaces in DC and AC microgrids

UNITV CONTROLANDOPERATIONOFMICROGRID 9

Modesofoperationandcontrolofmicrogrid:gridconnectedandislandedmode,Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillattainknowledgeonthevariousschemesofconventionaland nonconventional power generation.

- Learnerswillhaveknowledgeonthetopologiesandenergysourcesofdistributed generation.
- Learnerswilllearnabouttherequirementsforgridinterconnectionanditsimpactwith NCE sources
- Learnerswillunderstandthefundamentalconceptof Microgrid.

REFERENCES

1 AmirnaserYezdani,andRezaIravani,"VoltageSourceConvertersinPowerSystems: Modeling, Control and Applications", IEEE John Wiley Publications, 2010.

2 DorinNeacsu,"PowerSwitchingConverters:MediumandHighPower",CRCPress, Taylor&Francis,2006

3 ChetanSinghSolanki,"SolarPhotoVoltaics",PHIlearningPvt.Ltd.,NewDelhi,2009

4 J.F.Manwell,J.G.McGowan"WindEnergyExplained,theorydesignand applications", Wiley publication 2010.

5 D.D.HallandR.P.Grover,"BiomassRegenerableEnergy",JohnWiley,NewYork,1987.

6 JohnTwidellandTonyWeir,"RenewableEnergyResources"TyalorandFrancis Publications,Secondedition2006.

22272E25A-WINDENERGYCONVERSIONSYSTEMS

3104

UNIT-IINTRODUCTION: **9**

HistoryofwindElectricgeneration-Darrieuswind-Horizontalandverticalaxis-Windturbine-other modern developments - Future possibilities.

UNIT-IIWINDRESOURCEANDITSPOTENTIALFORELECVTRICPOWER

GENERATION: **9**

PowerExtractedByAWindDrivenMachine -Natureandoccurrenceofwind characteristicsandpowerproduction-variationofmeanwindspeedwithtime.

UNIT-IIIWINDPOWERSITESANDWINDMEASUREMENTS: **9**

Average wind speed and other factors affecting choice ofthe site - Effect ofwind direction - Measurement of wind velocity - Personal estimation without instruments- anemometers - Measurement of wind direction.

UNIT-IV WIND TURBINES WITH ASYNCHRONOUS GENERATORS AND

CONTROLASPECTS: **9**

Asynchronoussystems-AcGenerators-SelfexcitationofInductionGenerator-SinglePhaseoperationofInductionGenerator-PermanenetmagnetGenerators-Basiccontrolaspects-fixedspeedratiocontrolscheme-fixedvsvariablespeed operation of WECS.

UNIT-VGENERATIONOFELECTRICITY **9**

Activeandreactivepower-PandQtransferinpowersystems-Powerconverters- Characteristics of Generators - Variable Speed options - Economics.

L= 45T=15P=0C=4

REFERENCES:

1. N.G.Calvert,'WindPowerPrinciples:TheirApplicationonsmallscale’,CharlesFriffin& co. Ltd, London, 1979.
2. GeraldW.Koeppel,“Pirnam’sandPowerfromthewind”,VanNastranReinhold Co., London, 1979.
3. GaryL.Johnson,“WindEnergySystem”,PrenticehallInc.,EnglewoodCliffs,New Jersey,1985.
4. WindenergyconversionsystembyL.Lfreris,Prenticehall(U.K)Ltd.,1990.

22272E25B-AITECHNIQUESTOPOWERSYSTEMS

3104

1. **INTRODUCTIONTONEURALNETWORKS 9**
   BasicsofANN-perceptron-deltalearningrule - backpropagationalgorithm-multilayer feed forward network - memory models - bi-directional associative memory - Hopfield network.

2. **APPLICATIONSTOPOWERSYSTEMPROBLEMS 9**
   Applicationofneuralnetworkstoloadforecasting -contingencyanalysis-VARcontrol-economic load dispatch.

3. **INTRODUCTIONTOFUZZYLOGIC 9**
   Crispness - vagueness - fuzziness - uncertainty - fuzzy set theory fuzzy sets - fuzzy set operations - fuzzy measures - fuzzy relations - fuzzy function - structure of fuzzy logic controller – fuzzification models - data base - rule base - inference engine defuzzification module.

4. **APPLICATIONSTOPOWERSYSTEMS 9**
   Decision making in power system control through fuzzy set theory - use of fuzzy set models of LP in power systems scheduling problems - fuzzy logic based power system stabilizer.

5. **GENETICALGORITHMANDITSAPPLICATIONSTOPOWERSYSTEMS 9**
   Introduction-simplegeneticalgorithm-reproduction-crossover-mutation–advanced operators in genetic search - applications to voltage control and stability studies.

L=45T =15P= 0C=4

REFERENCES:

1. JamesA.FreemanandSkapura.B.M,„NeuralNetworks-AlgorithmsApplications andProgramming Techniques‟, Addison Wesley, 1990.
2. GeorgeKlirandTinaFolger.A,„„Fuzzysets,UncertaintyandInformation‟,PrenticeHallof India,1993.
3. Zimmerman.H.J,„„FuzzySetTheoryanditsApplications‟,KluwerAcademicPublishers 1994.
4. IEEEtutorialon„ApplicationofNeuralNetworktoPowerSystems‟,1996.
5. LoiLeiLai,„„IntelligentSystemApplicationsinPowerEngineering‟,JohnWiley&SonsLtd.,1 998.

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22272E25C ELECTRICAL DISTRIBUTION SYSTEM LTPC

OBJECTIVES: 3003

- Toprovideknowledgeaboutthedistributionsystemelectricalcharacteristics
- Togainknowledgeaboutplanninganddesigningofdistributionsystem
- Toanalyzepowerqualityindistributionsystem
- Toanalyzethepowerflowinbalancedandunbalancedsystem

UNITI INTRODUCTION 9

DistributionSystem-DistributionFeederElectricalCharacteristics-NatureofLoads:IndividualCustomerLoad,DistributionTransformerLoadingandFeederLoad-Approximate MethodofAnalysis:VoltageDrop,LineImpedance,"K"Factors,UniformlyDistributedLoadsand Lumping Loads in Geometric Configurations.

UNITII DISTRIBUTIONSYSTEMPLANNING 9

Factors effecting planning, present techniques, planning models(Short term planning, long term planning and dynamic planning), planning in the future, future nature of distribution planning,RoleofcomputerinDistributionplanning.Loadforecast,LoadcharacteristicsandLoad models.

UNITIII DISTRIBUTIONSYSTEMLINEMODEL 9

ExactLineSegmentModel-ModifiedLineModel-ApproximateLineSegmentModel-Modified "Ladder"IterativeTechnique-GeneralMatricesforParallelLines.

UNITIV VOLTAGEREGULATION 9

Standard Voltage Ratings-Two-Winding Transformer Theory-Two-Winding Autotransformer-Step-Voltage Regulators: Single-Phase Step-Voltage Regulators-Three-Phase Step-Voltage Regulators- Application of capacitors in Distribution system.

UNITV DISTRIBUTIONFEEDERANALYSIS 9

Power-Flow Analysis- Ladder Iterative Technique -Unbalanced Three-Phase Distribution Feeder-ModifiedLadderIterativeTechnique-LoadAllocation-Short-CircuitStudies.

TOTAL:45PERIODS

OUTCOMES:

- Abilitytoapplytheconceptsofplanninganddesignofdistributionsystemforutilitysystems
- Abilitytoimplementtheconceptsofvolatagecontrolindistributionsystem.
- Abilitytoanalyzethepowerflowinbalancedandunbalancedsystem

REFERENCES

1. WilliamH.Kersting,"DistributionSystemModelingandAnalysis"CRCpress3rd edition,2012.

2. TuranGonen,“ElectricPowerDistributionSystemEngineering”,McGrawHillCompany. 1986
3. JamesNorthcote–Green,RobertWilson,“ControlandAutomationofElectricalPower Distribution Systems”, CRC Press, New York, 2007.
4. PablaHS,“ElectricalPowerDistributionSystems”,TataMcGrawHill.2004

22272E25D ENERGY MANAGEMENT AND AUDITING L T P C

OBJECTIVES: 3003

- Tostudytheconceptsbehindeconomicanalysisand Loadmanagement.
- Toemphasizetheenergymanagementonvariouselectricalequipmentsandmetering.
- Toillustratetheconceptoflightingsystemsandcogeneration.

UNITI INTRODUCTION 9

Needforenergymanagement-energybasics-designingandstartinganenergymanagement program–energyaccounting-energymonitoring,targetingandreporting-energyaudit process.

UNITII ENERGYCOSTANDLOADMANAGEMENT 9

Importantconceptsinaneconomicanalysis-Economicmodels-Timevalueofmoney-Utilityrate structures-costofelectricity-Lossevaluation-Loadmanagement:Demandcontroltechniques-Utilitymonitoringandcontrolsystem-HVACandenergymanagement-Economic justification.

UNITIII ENERGYMANAGEMENTFORMOTORS,SYSTEMS,ANDELECTRICAL EQUIPMENT 9

Systemsandequipment-Electricmotors-Transformersandreactors-Capacitorsand synchronous machines.

UNITIV METERINGFORENERGYMANAGEMENT 9

Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples.

UNITV LIGHTINGSYSTEMS&COGENERATION 9

Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration:Formsofcogeneration-feasibilityofcogeneration-Electricalinterconnection.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldeveloptheabilitytolearnabouttheneedforenergymanagementand auditingprocess
- Learnerswilllearnaboutbasicconceptsofeconomicanalysisandloadmanagement.
- Studentswillunderstandtheenergymanagementonvariouselectricalequipments.
- Studentswillhaveknowledgeontheconceptsofmeteringandfactorsinfluencing costfunction

- Studentswillbeabletolearnabouttheconceptoflightingsystems,lightsourcesandvarious forms of cogeneration

REFERENCES

1 BarneyL.Capehart,WayneC.Turner,andWilliamJ.Kennedy,“GuidetoEnergy Management”, Fifth Edition, The Fairmont Press, Inc., 2006
2 EastopT.D&CroftD.R,“EnergyEfficiencyforEngineersandTechnologists”,LogmanScientific &Technical,1990.
3 ReayD.A,“IndustrialEnergyConservation”,1stedition,PergamonPress,1977.
4 “IEEERecommendedPracticeforEnergyManagementinIndustrialandCommercial Facilities”,IEEE, 1996
5 AmitK.Tyagi,“HandbookonEnergyAuditsandManagement”,TERI,2003.

22272E32A-POWERELECTRONICSAPPLICATIONSINPOWERSYSTEMS

3104

UNIT:ISTATICCOMPENSATORCONTROL 9

Theoryofloadcompensation-voltageregulationandpowerfactorcorrection-phase balance and PFcorrectionofunsymmetrical loads - Propertyofstatic compensator -Thyristorcontrolledrectifier(TCR)-ThyristorControlledCapacitor(TSC)-Saturablecore reactor - Control Strategies.

UNIT:IIHARMONICCONTROLANDPOWERFACTORIMPROVEMENT 9

Inputpowerfactorfordifferenttypesofconverters-powerfactorimprovementusingLoadand forced commutated converters.

UNIT:IIIVOLTAGECONTROLUSINGSTATICTAP-CHANGERS 9

Conventionaltapchangingmethods,statictapchangersusingThyristor,differentschemes-comparison.

UNIT:IVSTATICEXCITATIONCONTROL 9

Solidstateexcitationofsynchronousgenerators-Differentschemes-Generexexcitation systems.

UNIT:VUNINTERRUPTABLEPOWERSUPPLYSYSTEM 9

Parallel,Redundantandnon-redundantUPS-Upsusingresonantpowerconverters- Switch mode power supplies.

L =45T=15P=0C=4

TEXTBOOK

Miller.T.J.E,"ReactivepowercontrolinElectricsystems".Wileyinterscience,NewYork,1982.

REFRENCES

1. "StaticCompensatorforACpowersystems",Proc.IEEvol.128Nov.1981.pp362-406.
2 "AStaticalternativetothetransformeronloadtapchanging",IEEETrans.OnPas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. "ImprovementsinThyristorcontrolledstaticon-loadtapcontrollersfortransformers",IEEETrans.onPAS,Vol.PAS-101,Sept.1982,pp3091-3095.
4. "ShuntThyristorrectifiersfortheGenerexExcitationsystems",IEEETrans.On PAS.PAS-96,July/August,1977, pp1219-1325.

22272E32B-POWERSYSTEMDYNAMICS

3104

1. SYNCHRONOUSMACHINEMODELLING 9

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine:stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkageandvoltage equations for stator and rotor in dq0 coordinates, electrical power and torque, physical interpretation of dq0 transformation,PerUnit Representations:L_{ad}-reciprocalperunitsystemandthatfrompower-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 RepresentationinStabilityStudies:Simplificationsforlarge-scalestudies:Neglectofstator$p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLINGOFEXCITATIONANDSPEEDGOVERNINGSYSTEMS 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 diagramof governor with transient droop compensation, Steamturbine modelling: Singlereheat tandem compounded type only and IEEE block diagram for dynamic simulation; generic speed-governing system model for normal speed/load control function.

3. SMALL-SIGNALSTABILITYANALYSISWITHOUTCONTROLLERS 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 systemstability: analysis with numerical example,

4. SMALL-SIGNALSTABILITYANALYSISWITHCONTROLLERS 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: Equationsina common referenceframe, equations inindividualmachinerotorcoordinates,illustration offormationofsystem state matrix for a two-machine system with classical modelsfor synchronousmachines, illustrationof stability analysis using a numerical example. Principle behind small-signal stability improvement methods: delta-omega and delta P-omega stabilizers.

5. ENHANCEMENTOFSMALLSIGNALSTABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-basedstabilizers – DigitalStabilizer – Excitationcontrol design – Exciter gain– Phase lead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L =45T=15P=0C=4

REFERENCES

1. P.Kundur,"PowerSystemStabilityandControl",McGraw-Hill,1993.
2. IEEECommitteeReport,"DynamicModelsforSteamandHydroTurbinesin Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.MAndersonandA.AFouad,"PowerSystemControlandStability",IowaState University Press, Ames, Iowa, 1978.

22272E32C ELECTRICVEHICLESANDPOWERMANAGEMENTL TP C

30 0 3

OBJECTIVES:

- Tounderstandtheconceptofelectricalvehiclesanditsoperations
- Tounderstandtheneedforenergystorageinhybridvehicles
- Toprovideknowledgeaboutvariouspossibleenergystoragetechnologiesthatcanbeused in electric vehicles

UNITI ELECTRICVEHICLESANDVEHICLEMECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics

UNITII ARCHITECTUREOFEV'sANDPOWERTRAINCOMPONENTS 9

ArchitectureofEV'sandHEV's –Plug-nHybridElectricVehicles(PHEV)- Powertraincomponents and sizing, Gears, Clutches, Transmission and Brakes

UNITIII CONTROLOFDCANDACDRIVES 9

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking)of induction motordrivesystem – Inductionmotor andpermanentmotor based vector control operation – Switched reluctance motor (SRM) drives

UNITIV BATTERYENERGYSTORAGESYSTEM 9

BatteryBasics,Differenttypes,BatteryParameters,Batterymodeling,TractionBatteries

UNITV ALTERNATIVEENERGYSTORAGESYSTEMS 9

Fuelcell–Characteristics-Types–hydrogenStorageSystemsandFuelcellEV–Ultracapacitors

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillunderstandtheoperationof Electricvehiclesandvariousenergystorage technologies for electrical vehicles

REFERENCES

1 IqbalHussain,"**ElectricandHybridVehicles:DesignFundamentals,Second Edition**"CRCPress,Taylor&FrancisGroup,SecondEdition(2011).

2 AliEmadi,MehrdadEhsani,JohnM.Miller,"VehicularElectricPowerSystems",Special IndianEdition,Marceldekker,Inc 2010.

22272E32D **ELECTROMAGNETICINTERFERENCEAND COMPATIBILITY**

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OBJECTIVES:

- Toprovidefundamentalknowledgeonelectromagneticinterferenceand electromagnetic compatibility.
- TostudytheimportanttechniquestocontrolEMIandEMC.
- ToexposetheknowledgeontestingtechniquesasperIndianandinternational standards in EMI measurement.

UNITI INTRODUCTION 9

Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulation typicalnoisepath-EMIpredictions and modeling,Cross talk -Methods ofeliminating interferences.

UNITII GROUNDINGANDCABLING 9

Cabling- types of cables, mechanism of EMI emission / coupling in cables –capacitive coupling inductivecoupling-shieldingtopreventmagneticradiation-shieldtransferimpedance,Grounding– safety grounds – signal grounds- single point and multipoint ground systems hybrid grounds- functional ground layout –grounding of cable shields- -guard shields- isolation, neutralizing transformers,shield grounding at highfrequencies,digitalgrounding-Earthmeasurement Methods

UNITIII BALANCING,FILTERINGANDSHIELDING 9

Power supply decoupling- decoupling filters-amplifier filtering –high frequencyfiltering-EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding – near and far fields shielding effectiveness - absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings - grounding of shields

UNITIVEMIINELEMENTSAN D C I R C U I T S 9

Electromagnetic emissions, n o i s e fr o m r e l a y s andswitches,non-linearitiesincircuits,passiveinter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

UNITV ELECTROSTATICDISCHARGE,STANDARDSANDTESTING TECHNIQUES 9

Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipment's- standards – FCC requirements – EMI measurements – Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

TOTAL: 45 PERIODS

OUTCOMES:

- RecognizethesourcesofConductedandradiatedEMIinPowerElectronicConvertersand consumer appliances and suggest remedial measures to mitigate the problems
- AssesstheinsertionlossanddesignEMIfilterstoreducetheloss
- DesignEMIfilters,common-modechokesandRC-snubbercircuitsmeasurestokeepthe interference within tolerable limits

38

REFERENCES

1. V.P.Kodali,“EngineeringElectromagneticCompatibility”,S.Chand,1996
2. HenryW.Ott,“Noisereductiontechniquesinelectronicsystems”,JohnWiley& Sons,1989
3. BernhardKeiser,“PrinciplesofElectro-magneticCompatibility”,ArtechHouse, Inc.(685cantonstreet,Norwood,MA020062USA) 1987
4. Bridges,J.EMilletaJ.andRicketts.L.W.,“EMPRadiationandProtective techniques”,JohnWileyandsons,USA 1976
5. WilliamDuffG.,&DonaldWhiteR.J,“SeriesonElectromagneticInterferenceand Compatibility”, Vol.
6. WestonDavidA.,“ElectromagneticCompatibility,PrinciplesandApplications”, 1991.

ELECTIVES–V(semester-III)

22272E33A-POWERCONDITIONING

3104

1. INTRODUCTION 9

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion,Voltagefluctuations,Powerfrequency variation,Poweracceptabilitycurves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEARLOADS 9

Single phase static and rotating AC/DC converters, Three phase static AC/DC converters, Battery chargers, Arc furnaces, Fluorescent lighting, pulse modulated devices, Adjustable speed drives.

3. MEASUREMENTANDANALYSISMETHODS 9

Voltage, Current, Power and Energy measurements, power factor measurements and definitions, event recorders, Measurement Error – Analysis: Analysis in the periodic steady state, Time domain methods, Frequency domain methods: Laplace′s, Fourier and Hartleytransform – The WalshTransform– Wavelet Transform.

4. ANALYSISANDCONVENTIONALMITIGATIONMETHODS 9

Analysis of power outages, Analysis of unbalance: Symmetrical componentsof 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. POWERQUALITYIMPROVEMENT 9

Utility-Customer interface –Harmonic filters: passive, Active andhybridfilters –Custom power devices: Network reconfiguring Devices, Load compensation using DSTATCOM, Voltage regulation using DSTATCOM, protectingsensitive loads using DVR, UPQC –control strategies: P- Q theory, Synchronous detection method – Custom power park –Status of application of custom power devices

L=45T =15P= 0C=4

REFERENCES:

1. ArindamGhosh“PowerQualityEnhancementUsingCustomPowerDevices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T,“ElectricPowerQuality”,StarsinaCirclePublications,1994(2nd edition)
3. Dugan.R.C,“ElectricalPowerSystemQuality”,TMH,2008.
4. Arrillga.A.JandNevilleR.Watson,PowerSystemHarmonics,JohnWileysecond Edition,2003.
5. DerekA.Paice,“Powerelectronicconverterharmonics”,JohnWiley&sons,1999.

ELECTIVES–V(semester-III)

22272E33B–DEREGULATEDPOWERSYSTEM

3104

1. FUNDAMENTALSANDARCHITECTUREOFPOWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-ahead and Spot) – Participating in Markets (Consumer and Producer Perspective) – bilateral markets– poolmarkets.Independent SystemOperator(ISO)-components-typesof ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICALCHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC –Static and Dynamic ATC – 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. TRANSMISSIONNETWORKSANDSYSTEMSECURITYSERVICES9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - FinancialTransmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKETPRICING 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. INDIANPOWERMARKET 9

Current Scenario – Regions – Restructuring Choices – Statewise Operating Strategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator –Regulatory andPolicydevelopment in Indianpower Sector –Opportunities for IPP and Capacity PowerProducer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – UnscheduledInterchangeRate–SystemMarginalRate–TradingSurplusGeneration – Applications.

L=45T =15P= 0C=4

REFERENCES

1. KankarBhattacharya,MathH.J.BollenandJaapE.Daalder,“Operationof Restructured Power Systems”, Kluwer Academic Publishers, 2001

2. LoiLeiLai,“PowersystemRestructuringandRegulation”,JohnWileysons,2001.
3. Shahidehpour.MandAlomoush.M,“RestructuringElectricalPowerSystems”, Marcel Decker Inc., 2001.
4. StevenStoft,“PowerSystemEconomics”,Wiley–IEEEPress,2002
5. DanielS.KirschenandGoranStrbac,“FundamentalsofPowerSystem Economics”, John Wiley& Sons Ltd., 2004.
6. ScholarlyTransactionPapersandUtilitywebsites

22272E33C CONTROLSYSTEMDESIGNFORPOWER ELECTRONICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- ToexploreconceptualbridgesbetweenthefieldsofControlSystemsandPower Electronics
- ToStudyControltheoriesandtechniquesrelevanttothedesignoffeedback controllers in Power Electronics.

UNITI MODELLINGOFDC-TO-DCPOWERCONVERTERS **9**

ModellingofBuckConverter,BoostConverter,Buck-BoostConverter,CukConverter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter General Mathematical Model for Power Electronics Devices.

UNITII SLIDINGMODECONTROLLERDESIGN **9**

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces, Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter.

UNITIII APPROXIMATELINEARIZATIONCONTROLLERDESIGN **9**

Linear FeedbackControl,PolePlacementbyFullStateFeedback, PolePlacementBased on Observer Design ,Reduced Order Observers , Generalized Proportional Integral Controllers, Passivity Based Control , Sliding Mode Control Implementation of Buck Converter , Boost Converter ,Buck-Boost Converter.

UNITIV NONLINEARCONTROLLERDESIGN **9**

Feedback Linearization Isidori’s CanonicalForm,Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced OrderObservers.

UNITV PREDICTIVECONTROLOFPOWERCONVERTERS **9**

BasicConcepts,Theory,andMethods,ApplicationofPredictiveControlinPower Electronics,AC-DC-ACConverterSystem,FaultsandDiagnosisSystemsinPower Converters.

TOTAL:45 PERIODS

OUTCOMES:

- Abilitytounderstandanoverviewonmodernlinearandnonlinearcontrol strategies for power electronics devices
- Abilitytomodelmodernpowerelectronicconvertersforindustrialapplications
- Abilitytodesignappropriatecontrollersformodernpowerelectronicsdevices.

REFERENCES

1. HeberttSira-Ramírez,RamónSilva-Ortigoza,“ControlDesignTechniquesin Power Electronics Devices”, Springer 2012

2. MaheshPatil,PankajRodey,“ControlSystemsforPowerElectronics:A Practical Guide”, Springer India, 2015.

3. BlaabjergJoséRodríguez,“AdvancedandIntelligentControlinPower Electronics and Drives” , Springer, 2014

4. EnriqueAcha,VassiliosAgelidis,OlimpoAnaya,TJEMiller,“PowerElectronic Control in Electrical Systems”, Newnes, 2002

5. MarijaD.AranyaChakrabortty,Marija,“ControlandOptimizationMethodsfor ElectricSmartGrids”,Springer,2012.

22272E33D PRINCIPLESOFEHVTRANSMISSION LTPC
3003

OBJECTIVES:

Toimpartknowledgeon,

- Typesofpowertransmissionandconfigurationsvariousparametersandvoltage gradients of transmission line conductors.
- ThedesignrequirementsofEHVACandDClines.

UNITI INTRODUCTION 9

Standardtransmissionvoltages-ACandDC–differentlineconfigurations–average valuesoflineparameters–powerhandlingcapacityandlineloss–costsoftransmission linesandequipment–mechanicalconsiderationsinlineperformance.

UNITII CALCULATIONOFLINEPARAMETERS 9

Calculationofresistance,inductanceandcapacitanceformulti-conductorlines–calculationofsequenceinductancesandcapacitances–lineparametersfordifferent modesofpropagation–effectofgroundreturn.

UNITIII VOLTAGEGRADIENTSOFCONDUCTORS 9

Charge-potentialrelationsformulti-conductorlines–surfacevoltagegradienton conductors–gradientfactorsandtheiruse–distributionofvoltagegradientonsub conductors of bundle - voltage gradients on conductors in the presence of ground wireson towers-I2R loss and corona loss-RIV.

UNITIV ELECTROSTATICFIELDANDDESIGNOFEHVLINES 9

Effect of EHV line on heavyvehicles- calculation ofelectrostatic field of AC lines-effect of highfieldonhumans,animals,andplants-measurementofelectrostaticfields–electrostatic Induction inunenergised circuit of a D/C line - induced voltagesininsulatedground wires - electromagnetic interference, Design of EHV lines.

UNITV HVDCLINES

Introduction- Reliability and failure issues-Design-tower, ROW, clearances, insulators,electrical and mechanical protection-Maintenance-Control and protection-D.C Electricfield band Magnetic field -Regulations and guide lines-underground line design.

TOTAL:45PERIODS

OUTCOMES:

- Abilitytomodelthetransmissionlinesandestimatethevoltagegradientsand losses
- AbilitytodesignEHVACandDCtransmissionlines

REFERENCES

1 RakoshDasBegamudre,“ExtraHighVoltageACTransmissionEngineering”,Second Edition,NewAgeInternationalPvt.Ltd.,2006.
2 PritindraChowdhari,“ElectromagnetictransientsinPowerSystem”,JohnWileyand SonsInc., 2009.
3 SunilS.Rao,“EHV-AC,HVDCTransmission&DistributionEngineering”,ThirdEdition, KhannaPublishers,2008.
4 William H. Bailey, Deborah E. Weil and James R. Stewart, “A Review on HVDC Power Transmission Environmental Issues”, Oak Ridge National Laboratory.
5 J.C Molburg, J.A. Kavicky, and K.C. Picel ,”A report on The design, Construction and operation of Long-distance High-Voltage Electricity Transmission Technologies”Argonne (National Laboratory) 2007.
6 “PowerEngineer’sHandbook”,RevisedandEnlarged6thEdition,TNEBEngineers’ Association,October2002.

ELECTIVES–VI(semester-III)

22272E34A-SOFTWAREFORCONTROLSYSTEMDESIGN

3104

1. INTRODUCTIONTODESIGNANDCLASSICALPIDCONTROL

Systems performance and specifications –Proportional, Integral and Derivative Controllers – Structure – Empirical tuning- Zeigler Nichols-Cohen Coon –Root Locusmethod –Openloop inversion-– Tuning using ISE,IAE andother performance indices.

2. COMPENSATORDESIGN

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 – Controllerdesign– 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

ProgramsusingMATLABsoftware

L =45T =15P=0C=4

REFERENCES

1. MAPLEVProgrammingguide.
2. MATLABusermanual.
3. SIMULINKusermanual.
4. K.Ogatta,"ModernControlEngineering",PHI,1997.
5. DorfandBishop,"ModerncontrolEngineering',AddisonWesley, 1998.

22272E34B-INDUSTRIALPOWERSYSTEMANALYSISAND DESIGN

31

04

1. MOTORSTARTINGSTUDIES **9**

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculation of Acceleration time-Motor Starting with Limited-Capacity Generators-Computer-Aided Analysis-Conclusions.

2. POWERFACTORCORRECTIONSTUDIES **9**

Introduction-System Description and Modeling-Acceptance Criteria-Frequency Scan Analysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis-Back-to-Back Switching-Summary and Conclusions.

3. HARMONICANALYSIS **9**

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

4. FLICKERANALYSIS **9**

Sources ofFlicker-FlickerAnalysis-FlickerCriteria-DataforFlickeranalysis-CaseStudy- Arc Furnace Load-Minimizing the Flicker Effects-Summary.

5. GROUNDGRIDANALYSIS **9**

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis -Improving the Performance of the Grounding Grids-Conclusions.

L =45T =15P=0C=4

REFERENCES

1. RamasamyNatarajan,"Computer-AidedPowerSystemAnalysis",MarcelDekkerInc., 2002.

22272E34C SOFTCOMPUTING TECHNIQUES LTPC

OBJECTIVES: 3003

- Toexposetheconceptsoffeedforwardneuralnetworks.
- Toprovideadequateknowledgeaboutfeedbackneuralnetworks.
- Toteachabouttheconceptoffuzzinessinvolvedinvarioussystems.
- Toexposetheideasaboutgeneticalgorithm
- ToprovideadequateknowledgeaboutofFLCandNNtoolbox

UNITIINTRODUCTIONANDARTIFICIALNEURALNETWORKS 9

Introduction to intelligent systems- Soft computing techniques-ConventionalComputing versus Swarm Computing - Classification of meta-heuristictechniques
- Properties of Swarm intelligent Systems - Application domain - Discrete andcontinuous problems - Single objective and multi-objective problems -Neuron-Nerve structure and synapse- Artificial Neuron anditsmodel-activationfunctions- Neural network architecture- single layer and multilayer feed forwardnetworks- Mc Culloch Pitts neuron model- perceptron model-Adaline andMadaline- multilayer perception model- back propogation learningmethods-effectoflearningrulecoefficient -backpropagationalgorithm-factors affecting backpropagation training- applications.

UNITIIARTIFICIALNEURALNETWORKSANDASSOCIATIVEMEMORY 9

Counter propagation network- architecture- functioning & characteristics ofcounter Propagation network- Hopfield/ Recurrent network configuration - stability constraints associative memory and characteristics- limitations andapplications- Hopfield v/s Boltzman machine- Adaptive Resonance Theory-Architecture- classifications- Implementation and training - Associative Memory.

UNITIII FUZZYLOGICSYSTEM 9

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation andapproximate reasoning. Introduction to fuzzy logic modeling and control-Fuzzification inferencing and defuzzification-Fuzzy knowledge and rule bases-Fuzzy modeling and control schemesfor nonlinear systems. Self organizing fuzzylogic control- Fuzzy logic control for nonlinear time delay system.

UNITIV GENETICALGORITHM 9

Evolutionary programs – Genetic algorithms, genetic programming andevolutionaryprogramming-GeneticAlgorithmversus
ConventionalOptimizationTechniques - Genetic representations and selection mechanisms; Geneticoperators- different types of crossover and mutation operators - OptimizationproblemsusingGA-discreteandcontinuous - Singleobjectiveand multi-objectiveproblems - Procedures in evolutionary programming.

UNITV HYBRIDCONTROLSCHEMES 9

FuzzificationandrulebaseusingANN–Neurofuzzysystems-ANFIS–FuzzyNeuron - Optimization of membership function and rule base using Genetic

Algorithm –Introduction to Support Vector Machine - EvolutionaryProgramming-Particle Swarm Optimization - Case study – Familiarization of NN,FLC and ANFIS Tool Box.

TOTAL:45PERIODS

OUTCOMES:

- WillbeabletoknowthebasicANNarchitectures,algorithmsandtheir limitations.
- Alsowillbeabletoknowthedifferentoperationsonthefuzzysets.
- WillbecapableofdevelopingANNbasedmodelsandcontrolschemesfor non-linear system.
- WillgetexpertiseintheuseofdifferentANNstructuresandonline training algorithm.
- WillbeknowledgeabletouseFuzzylogicformodelingandcontrolofnon-linear systems.
- WillbecompetenttousehybridcontrolschemesandP.S.Oand supportvector Regressive.

TEXTBOOKS:

1. LaureneV.Fausett,"FundamentalsofNeuralNetworks:Architectures, Algorithms And Applications", Pearson Education.
2. TimothyJ.Ross,"FuzzyLogicwithEngineeringApplications"WileyIndia, 2008.
3. ZimmermannH.J."FuzzysettheoryanditsApplications"Springer internationaledition,2011.
4. DavidE.Goldberg,"GeneticAlgorithmsinSearch,Optimization,and Machine Learning", Pearson Education, 2009.
5. W.T.Miller,R.S.SuttonandP.J.Webrose,"NeuralNetworksforControl" MIT Press", 1996.
6. T.Ross,"FuzzyLogicwithEngineeringApplications",TataMcGrawHill, New Delhi, 1995.
7. Ethem Alpaydin, "Introduction to Machine Learning (Adaptive ComputationandMachineLearningSeries)",MITPress, 2004.
8. CorinnaCortesandV.Vapnik,"Support -VectorNetworks,Machine Learning" 1995.

22272E34D	**RESTRUCTURED POWER SYSTEM**	**LTPC**
OBJECTIVES:		**3003**

- Tointroducetherestructuringofpowerindustryandmarketmodels.
- To impart knowledge on fundamental concepts of congestion management.
- Toanalyzetheconceptsoflocationalmarginalpricingandfinancial transmission rights.
- ToIllustrateaboutvariouspowersectorsinIndia

UNITIINTRODUCTIONTORESTRUCTURINGOFPOWERINDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issues involvedinderegulation,Deregulationofvariouspowersystems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Shortand long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis – a – vis other commodities, Market architecture, Case study.

UNITII TRANSMISSIONCONGESTIONMANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing– Lossless DCOPF model forLMPcalculation –LosscompensatedDCOPF model forLMPcalculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequency –FTRissuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flowgate rights – FTR and market power -FTRandmerchanttransmissioninvestment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services – Voltage control and reactive power support devices – Black start capability service - How to obtain ancillary service –Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled intransmissionpricing methods – Marginal transmission pricing paradigm – Composite pricingparadigm – Merits and demerits of different paradigm.

UNITV REFORMSININDIANPOWERSECTOR 9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillhaveknowledgeonrestructuringofpowerindustry
- Learnerswillunderstandbasicsofcongestionmanagement
- Learnerswillattainknowledgeaboutlocationalmarginpricesand financial transmission rights
- Learnerswillunderstandthesignificanceancillaryservicesandpricingof transmission network
- LearnerswillhaveknowledgeonthevariouspowersectorsinIndia

REFERENCES

1. Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, “Restructured electrical power systems: operation, trading and volatility” Pub., 2001.
2. Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, “Operation of restructured power systems”, Kluwer Academic Pub., 2001.
3. Paranjothi,S.R.,“ModernPowerSystems”Paranjothi,S.R.,NewAge International,2017.
4. SallyHunt,”Makingcompetitionworkinelectricity”,JohnWilleyandSons Inc.2002.
5. StevenStoft,“Powersystemeconomics:designingmarketsforelectricity”, JohnWiley&Sons, 2002.

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PRISTUNIVERSITY

FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENTOFELECTRICALANDELECTRONICSENGINEERING

PROGRAMME: M.TECH-POWER SYSTEMS (PART TIME)

CURRICULUM -REGULATION 2022

SEMESTER–I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22248S11DP	AppliedMathematicsfor Power SystemEngineering	3	1	0	4
2.	22272C12P	SystemTheory	3	1	0	4
3.	22272C13P	AdvancedPower System Analysis	3	1	0	4
4.	22272L14P	Power System SimulationLaboratory	0	0	3	3
		TOTAL				**15**

SEMESTER–II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C21P	EHVpowertransmission.	3	1	0	4
2	22272C22P	AdvancedPowerSystem Protection	3	1	0	4
3	22272E23_P	Elective-I	3	0	0	3
4	222TECWRP	Technical Writing/Seminars	0	0	3	3
		TOTAL				**14**

SEMESTER– III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C31P	EconomicOperationsof Power Systems	3	1	0	4
2	22272C32P	HVDCand FACTS	3	1	0	4
3	22272E33_P	Elective–II	3	0	0	3
4	22272L34P	Advanced Power SystemSimulation Laboratory	0	0	3	3
		TOTAL				**14**

SEMESTER–IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272C41P	PowerSystemControl	3	1	0	4
2	22272C42P	ElectricalTransientsin power systems	3	1	0	4
3	22272E43_P	Elective–III	3	0	0	3
4	22272P44P	ProjectworkPhase–I	0	0	10	10
		TOTAL				**21**

SEMESTER–V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22272E51_P	Elective–IV	3	0	0	3
2.	22272E52_P	Elective–V	3	0	0	3
3.	22272E53_P	Elective–VI	3	0	0	3
		TOTAL				**9**

SEMESTER–VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1.	22272P61P	ProjectworkPhase-II	0	0	15	**15**

TotalCredits=88

Elective –I

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E23AP	AnalysisandDesignof Power Converters	3	0	0	3
2.	22272E23BP	ModelingandAnalysis of Electrical Machines	3	0	0	3
3.	22272E23CP	Advanced Power SystemDynamics	3	0	0	3
4.	22272E23DP	Analysis and Computation of Electromagnetic Transients in Power Systems	3	0	0	3

Elective–II

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E33AP	SmartGrid	3	0	0	3
2.	22272E33BP	SolarandEnergy StorageSystems	3	0	0	3
3.	22272E33CP	PowerSystem Reliability	3	0	0	3
4.	22272E33DP	DistributedGeneration and Microgrid	3	0	0	3

Elective–III

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E43AP	WindEnergyconversion systems	3	0	0	3
2.	22272E43BP	AITechniquestoPower Systems	3	0	0	3
3.	22272E43CP	ElectricalDistribution System	3	0	0	3
4.	22272E43DP	EnergyManagement and Auditing	3	0	0	3

Elective–IV

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E51AP	Power Electronics applicationsinPower systems	3	0	0	3
2.	22272E51BP	PowersystemDynamics	3	0	0	3
3.	22272E51CP	ElectricVehiclesand PowerManagement	3	0	0	3
4.	22272E51DP	Electromagnetic Interferenceand Compatibility	3	0	0	3

Elective –V

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22275E52AP	PowerConditioning	3	0	0	3
2.	22275E52BP	DeregulatedPower System	3	0	0	3
3.	22275E52CP	ControlSystemDesign for Power Electronics	3	0	0	3
4.	22275E52DP	PrinciplesofEHV Transmission	3	0	0	3

Elective–VI

SL.NO.	SUBJECT CODE	SUBJECT	L	T	P	C
1	22272E53AP	SoftwareforControl system Design	3	0	0	3
2.	22272E53BP	IndustrialPowersystem analysis and design	3	0	0	3
3.	22272E53CP	SoftComputing Techniques	3	0	0	3
4.	22272E53DP	RestructuredPower System	3	0	0	3

CreditDistribution

Sem.	CoreCourses				Elective Courses		TotalCredits
	Theory Courses		Practical Courses				
	Nos.	Credits	Nos.	Credits	Nos.	Credits	
I	02	08	01	03	-	-	15
II	02	08	01	03	01	03	14
III	02	08	01	03	01	03	14
IV	02	08	01	10	01	03	21
V	-	-	-	-	03	09	09
VI	-	-	01	15	-	-	15
						TotalCredits	**88**

HOD **DEAN**

DEANACADEMICAFFAIRS

SYLLABUS

22248S11DP-APPLIEDMATHEMATICSFORPOWERSYSTEMENGINEERING

3104

1. ADVANCEDMATRIXTHEORY 9

Matrixnorms–Jordancanonicalform–Generalizedeigenvectors–Singularvaluedecomposition – Pseudo inverse – Least square approximations.

2. RANDOMPROCESSES 9

Random variable, discrete, continuous types - Binomial, Poisson,normalandexponential distributions density & distribution Functions- Moments Moment GeneratingFunctions – Notionofstochasticprocesses -Auto-correlation –Crosscorrelation.

3. LINEARPROGRAMMING 9

Basicconcepts –Graphicaland methods –Transportationproblem – SimplexAssignment problem.

4. DYNAMICPROGRAMMING 9

Elementsofthedynamicprogrammingmodel–optimalityprinciple–Examplesofdynamic programming models and their solutions.

5. INTEGRAL TRANSFORMS 9

FiniteFouriertransform-Fourierseries-FinitesineTransform - Cosinetransform - finite Hankel transform - definition, Transform of df/dx where p is a rootofJn(p)=0, Transformof

d2f 1 df d2f 1 df n2f
---+------,and Transformof----+---------- dx2 xdx
dx2 x dx x2

L= 45T= 15P= 0C=4

REFERENCES

1. Lewis.D.W.,MatrixTheory,AlliedPublishers,Chennai1995.
2. Bronson, R, Matrix Operations, Schaums outlineSeries,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.andHira,D.S.,"OperationsResearch",S.Chand&Co.,NewDelhi, (1999).6..
6. Ochi,M.K."AppliedProbabilityandStochasticProcesses",JohnWiley&Sons (1992).
7. PeeblesJr.,P.Z.,"Probability Random VariablesandRandom Signal Principles, McGraw Hill Inc., (1993).

22272C12P-SYSTEMTHEORY

3104

1. PHYSICALSYSTEMSANDSTATE ASSIGNMENT **9**

Systems-electrical-mechanical-hydraulic-pneumatic-thermalsystems -modellingofsome typical systems like D.C. Machines - inverted pendulum.

2. STATESPACE ANALYSIS **9**

Realisation of state models - non-uniqueness - minimal realisation - balanced realisation - solution of state equations - state transition matrixand its properties - free and forced responses - properties - controllability and observability - stabilisability and detectability - Kalman decomposition.

3. MIMOSYSTEMS-FREQUENCYDOMAINDESCRIPTIONS **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-LINEARSYSTEMS **9**

Typesofnon-linearity-typicalexamples-equivalent linearization-phaseplaneanalysis-limit cycles - describing functions - analysis using describing functions - jump resonance.

5. STABILITY **9**

Stability concepts - equilibrium points - BIBO and asymptotic stability - direct method of Liapunov - application to non-linear problems - frequency domain stability criteria - Popov's method and its extensions.

L= 45T =15P= 0C=4

REFERENCES

1. M.Gopal,'ModernControlEngineering',Wiley,1996.
2. J.S.Bay,'LinearStateSpaceSystems',McGraw-Hill, 1999.
3. Eroni-UmezandEroni,'Systemdynamics&Control',ThomsonBrooks/Cole, 1998.
4. K.Ogatta,'ModernControlEngineering',PearsonEducation,LowPriced Edition,1997.
5. G.J.Thaler,'Automaticcontrolsystems',Jaicopublishers, 1993.
6. JohnS.Bay,'LinearStateSpaceSystems',McGraw-HillInternationalEdition,1999.

22272C13P-ADVANCEDPOWERSYSTEMANALYSIS

3104

OBJECTIVES:

- Tointroducedifferenttechniquesofdealingwithsparsematrixforlargescalepower systems.
- Toimpartin-depthknowledgeondifferentmethodsofpowerflowsolutions.
- Toperformoptimalpowerflow solutionsindetail.
- Toperformshortcircuit faultanalysisandunderstandtheconsequenceofdifferent type of faults.
- ToIllustratedifferentnumericalintegrationmethodsandfactorsinfluencing transient stability

UNITI SOLUTIONTECHNIQUE 9

SparseMatrixtechniques forlargescalepowersystems:Optimalorderingschemesforpreserving 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.

UNITII POWERFLOWANALYSIS 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..

UNITIII OPTIMALPOWERFLOW 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.

UNITIV SHORTCIRCUIT ANALYSIS 9

Formation of bus impedance matrix with mutual coupling (single phase basis and three phase basis)-Computermethod forfaultanalysisusingZBUSandsequence components.Derivationof equations for bus voltages, fault current and line currents, both in sequence and phase – symmetrical and unsymmetrical faults.

UNITV TRANSIENTSTABILITY ANALYSIS 9

Introduction, Numerical Integration Methods: Euler and Fourth Order Runge-Kutta methods, Algorithm for simulation of SMIB and multi-machine system with classicalsynchronous machine model; Factors influencing transient stability, Numerical stability and implicit Integration methods.

L= 45T = 15P= 0C=4

OUTCOMES:

- Abilitytoapplytheconceptsofsparsematrix for largescalepowersystemanalysis
- Ability to analyze power system studies thatneeded for the transmission systemplanning.

REFERENCES:

1. A.J.WoodandB.F.Wollenberg,“PowerGenerationOperationandControl”,JohnWileyand sons, New York, 1996.
2. W.F.Tinney and W.S.Meyer, “Solution of Large Sparse System by Ordered Triangular Factorization” IEEE Trans. on Automatic Control, Vol : AC-18, pp:333346 Aug 1973.
3.K.Zollenkopf, “Bi-Factorization: Basic Computational Algorithm and Programming Techniques ; pp:75-96 ; Book on “Large Sparse Set of Linear Systems” Editor: J.K.Rerd,Academic Press, 1971.
4. M.A.Pai,”ComputerTechniquesinPowerSystemAnalysis”,TataMcGraw-HillPublishing Company Limited, New Delhi, 2006.
5. GWStagg,A.HEl.Abiad,“ComputerMethodsinPowerSystemAnalysis”,McGrawHill, 1968.
6. P.Kundur,“PowerSystemStabilityandControl”,McGrawHill,1994.

22272L14P-POWERSYSTEMSIMULATION LABORATORY 0033

OBJECTIVES:

- Tohavehandsonexperienceonvarioussystemstudiesanddifferenttechniquesused
- forsystemplanningusingSoftware packages
- Toperformthedynamic analysisofpower system
-

LISTOFEXPERIMENTS

1. PowerflowanalysisbyNewton-RaphsonmethodandFastdecoupledmethod

2. Transientstabilityanalysisofsinglemachine-infinitebussystemusingclassicalmachine model

3. Contingencyanalysis: Generatorshiftfactorsandlineoutagedistributionfactors

4. Economicdispatchusinglambda-iterationmethod

5. Unitcommitment:Priority-listschemesanddynamicprogramming

6. StateEstimation(DC)

7. AnalysisofswitchingsurgeusingEMTP: Energisationofalongdistributed-parameterline

8. AnalysisofswitchingsurgeusingEMTP :Computationoftransientrecoveryvoltage

9. SimulationandImplementationofVoltageSourceInverter

10. DigitalOverCurrent RelaySettingandRelayCoordinationusingSuitablesoftwarepackages 11

Co-ordination of over-current and distance relays for radial line protection

TOTAL:60PERIODS

OUTCOMES:

- UponCompletionofthecourse,thestudentswillbeable to:
- AnalyzethepowerflowusingNewton-RaphsonmethodandFastdecoupledmethod.
- Performcontingencyanalysis&economic dispatch
- SetDigitalOverCurrentRelayandCoordinateRelay

P=3 C=3

SEMESTER-II

22272C21P-EHVPOWERTRANSMISSION

3104

1. INTRODUCTION 9

Standard transmission voltages – different configurations of EHV and UHV lines – averagevaluesof lineparameters – powerhandling capacity and lineloss – costs oftransmission lines and equipment – mechanical considerations in line performance.

2. CALCULATIONOFLINE 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. VOLTAGEGRADIENTSOFCONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use– distribution of voltage gradienton 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. ELECTROSTATICFIELDOFEHVLINES 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 ofaD/C line - induced voltages in insulated ground wires - electromagnetic interference

L= 45T = 15P= 0C=4

REFERENCES

1. Rakosh Das Begamudre, "Extra High Voltage AC Transmission Engineering", Second Edition, New Age International Pvt. Ltd., 1990.
2. PowerEngineer'sHandbook,RevisedandEnlarged6thEdition,TNEBEngineers' Association, October 2002.
3. MicrotranPowerSystemAnalysisCorporation,MicrotranReferenceManual,Vancouver Canada. (Website: www.microtran.com).

22272C22P - ADVANCED POWER SYSTEM PROTECTION 3104

OBJECTIVES:

- Toillustrateconceptsoftransformerprotection
- TodescribeaboutthevariousschemesofOver currentprotection
- Toanalyzedistanceandcarrier protection
- Tofamiliarizethe conceptsofGeneratorprotectionandNumericalprotection

UNITI OVERCURRENT&EARTHFAULTPROTECTION 9

Zones of protection – Primary and Backup protection – operating principles and Relay Construction - Time – Current characteristics-Current setting – Time setting-Over current protective schemes –Concept of Coordination - Protection of parallel / ring feeders – Reverse power or directional relay –Polarisation Techniques – Cross Polarisation – Quadrature Connection -Earth fault and phase fault protection - Combined Earth fault and phase fault protection scheme - Phase fault protective - scheme directional earth fault relay - Static over currentrelays–Numericalover–currentprotection;numericalcoordinationexampleforaradial feeder

UNITII TRANSFORMER &BUSBARPROTECTION 9

Types of transformers –Types of faults in transformers- Types of Differential Protection – High Impedance – External fault with one CT saturation – Actual behaviors of a protective CT – Circuit model of a saturated CT - Need for high impedance – Disadvantages - Percentage Differential Bias Characteristics – Vector group & its impact on differential protection - Inrush phenomenon – Zero Sequence filtering – High resistance Ground Faults in Transformers – Restricted Earth fault Protection - Inter-turn faults in transformers – Incipient faults in transformers - Phenomenon of overfluxing in transformers – Transformer protection application chart. Differential protection of busbars external and internal fault - Supervisory relay-protection of three – Phase busbars – Numerical examples on design of high impedance busbar differential scheme –Biased Differential Characteristics – Comparison between Transformer differential & Busbar differential.

UNITIII DISTANCEANDCARRIERPROTECTIONOFTRANSMISSION LINES 9

Drawback ofover –Current protection– Introductionto distancerelay– Simple impedancerelay – Reactance relay – mho relays comparison of distance relay – Distance protection of a three – Phaseline-reasonsforinaccuracyofdistancerelayreach -ThreesteppeddistanceprotectionTrip contact configuration for the three - Stepped distance protection - Three-stepped protection f three-phase line against all ten shunt faults - Impedance seen from relay side - Three-stepped protection of double end fed lines-need for carrier – Aided protection – Various options for a carrier –Coupling and trapping the carrier into the desired line section - Unit type carrier aided directional comparison relaying – Carrier aided distance schemes for acceleration of zone II; numerical example for a typical distance protection scheme for a transmission line.

UNITIVGENERATORPROTECTION **9**

Electrical circuit of the generator –Various faults and abnormal operating conditions – Stator Winding Faults – Protection against Stator (earth) faults – third harmonic voltage protection – Rotor fault – Abnormal operating conditions - Protection against Rotor faults – Potentiometer Method – injection method – Pole slipping – Loss of excitation – Protection against Mechanical faults; Numerical examples for typical generator protection schemes

UNITVNUMERICALPROTECTION

Introduction–Blockdiagramofnumericalrelay -Samplingtheorem-Correlationwithareference (LES) technique-Digital filtering-numerical over - Current protection– Numerical transformer differential protection-Numerical distance protection of transmission line

L= 45T = 15P= 0C=4

OUTCOMES:

- LearnerswillbeabletounderstandthevariousschemesavailableinTransformer
- protection
- LearnerswillhaveknowledgeonOvercurrentprotection.
- LearnerswillattainknowledgeaboutDistanceandCarrierprotectionintransmission lines.
- LearnerswillunderstandtheconceptsofGeneratorprotection.
- Learnerswillattainbasicknowledgeonsubstationautomation.

REFERENCES

1 Y.G. Paithankar and S.R Bhide, "Fundamentals of Power System Protection", Prentice-Hall of India, 2003

2 Badri Ram and D.N. Vishwakarma, "Power System Protection and Switchgear", Tata McGraw- Hill Publishing Company, 2002.

3 T.S.M.Rao,"DigitalRelay/Numericalrelays",TataMcGrawHill,NewDelhi, 1989.

4 P.Kundur,"PowerSystemStabilityandControl",McGraw-Hill,1993.

22272C31P-ECONOMICOPERATIONSOFPOWERSYSTEMS

3104

1. INTRODUCTION 9

Planning and operational problems of power systems – review of economic dispatch and calculation using B matrix loss formula – use ofparticipation factors inon line economic dispatch.

2. OPTIMALPOWERFLOW 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. HYDROTHERMALSCHEDULING 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. UNITCOMMITMENT 9

Constraintsinunit commitment –solution byprioritylist method –dynamicprogramming method – backward and forward – restricted search range.

5. MAINTENANCESCHEDULING 9

Factors considered in maintenance scheduling for generating units – turbines – boilers – introduction to maintenance scheduling using mathematical programming.

L= 45T = 15P= 0C=4

REFERENCES

1. Allen J.Wood and Bruce F.Wollenberg, "Power generation and control", John Wiley & Sons, New York, 1984.
2. Krichmayer L., "Economic operationofpowersystems", JohnWileyand sonsInc, New York, 1958.
3. KrichmayerL.K,"EconomiccontrolofInterconnectedsystems",JhonWiley andsonsInc, New York, 1959.
4. ElgerdO.I.,"Electricenergysystemstheory–anintroduction",McGrawHill,NewDelhi, 1971.

22272C32P-HVDCandFACTS

3104

OBJECTIVES:

- ToemphasistheneedforFACTS controllers.
- Tolearnthecharacteristics,applicationsandmodelingofseriesandcontrollers.
- ToanalyzetheinteractionofdifferentFACTScontrollerand coordination
- Toimpartknowledgeonoperation,modellingandcontrolofHVDClink.
- ToperformsteadystateanalysisofAC/DC system.

UNITI INTRODUCTION 9

Review of basics of power transmissionnetworks-control of power flow in ACtransmission line-Analysis of uncompensated AC Transmission line- Passive reactive power compensation: Effect of series and shunt compensation at the mid-point of the line on power transfer- Need for FACTS controllers- types of FACTS controllers. Comparison of AC & DC Transmission, Applications of DC Transmission Topologies.

UNITII SVC&STATCOM 9

Configuration of SVC- voltage regulation by SVC- Modelling of SVC for load flow analysisDesign of SVC to regulate the mid-point voltage of a SMIB system- Applications Static synchronous compensator (STATCOM)- Operation of STATCOM – Voltage regulation– Power flow control with STATCOM.

UNITIII TCSC andSSSC 9

Concepts ofControlledSeriesCompensation-OperationofTCSC-AnalysisofTCSCoperation - Modelling of TCSC for load flow studies - Static synchronous series compensator (SSSC)-Operation of SSSC - Modelling of SSSC for power flow – operation of Unified power flow controllers(UPFC).

UNITIV ANALYSISOFHVDCLINK 9

Simplified analysis of six pulse Graetz bridge – Charecteristics - Analysisof converter operations–Commutationoverlap–EquivalencecircuitofbipolarDCtransmissionlink– Modes of operation – Mode ambiguity – Different firing angle controllers – Power flow control.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

PerunitsystemforDC Quantities -ModellingofDClinks-SolutionofDCloadflow-Solution of AC-DC power flow – Unified and Sequential methods.

TOTAL:45 PERIODS

OUTCOMES:

- Learners will be able to refresh on basics of power transmission networks and need forFACTS controllers
- Learners will understand the significance about different voltage source converter based FACTS controllers
- LearnerswillunderstandthesignificanceofHVDC convertersandHVDCsystemcontrol
- LearnerswillattainknowledgeonAC/DCpowerflowanalysis

REFERENCES

1. MohanMathur,R.,Rajiv.K.Varma,“Thyristor–BasedFactsControllersforElectrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc.
2. K.R.Padiyar, “FACTS Controllers in Power Transmission and Distribution”, New Age International (P) Ltd., Publishers, New Delhi, Reprint 2008.
3. K.R.Padiyar,“HVDCPowerTransmissionSystems”,NewAgeInternational(P)Ltd., New Delhi, 2002.
4. J.Arrillaga,“HighVoltageDirectCurrentTransmission”,PeterPregrinus,London,1983.
5. V.K.Sood,“HVDCandFACTScontrollers-ApplicationsofStaticConvertersinPower System”, Kluwer Academic Publishers 2004

22272L34P-ADVANCEDPOWERSYSTEMSIMULATION LABORATORY **LTPC**

0042

OBJECTIVES:

- ToanalyzetheeffectofFACTS controllersbyperformingsteadystate analysis.
- Tohavehandsonexperienceondifferentwindenergyconversiontechnologies

LISTOFEXPERIMENTS

1. Small-signalstabilityanalysisofsinglemachine-infinitebussystemusingclassical machine model
2. Small-signalstabilityanalysisofmulti-machineconfigurationwithclassicalmachine model
3. Inductionmotorstartinganalysis
4. Loadflowanalysisoftwo-bussystemwithSTATCOM
5. Transientanalysis oftwo-bussystemwithSTATCOM
6. AvailableTransferCapabilitycalculationusinganexistingloadflowprogram
7. Studyofvariablespeed wind energyconversionsystem-DFIG
8. Studyofvariable speedwind energyconversionsystem-PMSG
9. ComputationofharmonicindicesgeneratedbyarectifierfeedingaR-Lload
10. Designofactivefilterformitigatingharmonics

SEMESTER –IV

22272C41P-POWER SYSTEMCONTROL **3104**

1. AUTOMATICGENERATIONCONTROL **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. AUTOMATICVOLTAGECONTROL **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. SECURITYCONTROL 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. COMPUTERCONTROL OFPOWER 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 inEMS system. Expert system applications for power system operation.

L = 45T = 15P= 0C =4

REFERENCES

1. Kundur.P.,“powersystemstabilityandcontrol”,McGrawHill,1994.
2. AndersonP.M.,andFouadA.A,“powersystemcontrolandstability”,Galgotiapublication,New Delhi, 1981.
3. TaylorC.W.,“powersystemsvoltagestability”,McGrawHill,NewDelhi,1993.
4. IEEErecommendedpracticeforexcitationsystemmodelsforpowersystem stability studies, IEEE standard 421.5, 1992.
5. Kimbark E.W., “power system stability”, Vol.3., Synchronous machines, John Wileyand sons, 1956.
6. T.VCustem,C.Vournas,“voltagestabilityofpowersystem”,KluwerAcadamicPublishers, 1998.
7. ElgerdO.L.,“Elctricenergysystemstheory–anintroduction”,McGrawHill,NewDelhi,1971.

22272C42P-ELECTRICALTRANSIENTSINPOWERSYSTEMS

3104

1. TRAVELLINGWAVES ON TRANSMISSIONLINE 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. COMPUTATIONOFPOWER SYSTEMTRANSIENTS 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, SWITCHINGANDTEMPORARYOVERVOLTAGES 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. BEHAVIOUROFWINDINGUNDER TRANSIENT CONDITION 9

Initial and Final voltage distribution - Winding oscillation - traveling wave solution - Behavior of the transformer core under surge condition – Rotating machine – Surge in generator and motor

5. INSULATION CO-ORDINATION 9

Principle of insulation co-ordination in Air Insulated substation (AIS) and Gas Insulated Substation (GIS), insulation level, statistical approach, co-ordination between insulation and protection level –overvoltage protective devices – lightning arresters, substation earthing.

L= 45T= 15P= 0C =4

REFERENCES

1. PritindraChowdhari,"Electromagnetictransients inPowerSystem",JohnWileyandSons Inc., 1996.
2. Allan Greenwood, "Electrical Transientsin Power System", Wiley & Sons Inc.New York,1991.
3. KlausRagaller,"SurgesinHighVoltageNetworks",PlenumPress,NewYork,1980.
4. RakoshDas Begamudre, "ExtraHighVoltageAC TransmissionEngineering", (Second edition) Newage International (P) Ltd., New Delhi, 1990.
5. NaiduMSandKamarajuV,"HighVoltageEngineering",TataMcGraw-HillPublishing Company Ltd., New Delhi, 2004.
6. IEEEGuideforsafetyinACsubstationgroundingIEEEStandard80-2000.
7. WorkingGroup33/13-09(1988),'VeryfasttransientphenomenaassociatedwithGas Insulated System', CIGRE, 33-13, pp. 1-2

22272E23AP– ANALYSIS ANDDESIGNOFPOWERCONVERTERSLT PC 3003

OBJECTIVES:

- Todeterminetheoperationandcharacteristicsofcontrolledrectifiers.
- Toapplyswitchingtechniquesand basictopologiesofDC-DCswitching regulators.
- Tointroducethedesignofpowerconvertercomponents.
- Toprovidean indepthknowledgeabout resonantconverters.
- TocomprehendtheconceptsofAC-ACpowerconvertersandtheir applications.

UNITI SINGLE PHASE& THREEPHASECONVERTERS 9

Principle of phase controlled converter operation – single-phase full converter and semi-converter (RL,RLE load)- single phase dual converter – Three phase operation full converter and semi-converter (R,RL,RLE load) – reactive power – power factor improvement techniques – PWM rectifiers.

UNITII DC-DCCONVERTERS 9

Limitations of linear power supplies, switched mode power conversion, Non-isolated DC-DC converters: operation and analysis of Buck, Boost, Buck-Boost, Cuk& SEPIC –undercontinuous and discontinuous operation – Isolated converters: basic operation of Flyback, Forward and Push-pull topologies.

UNITIII DESIGNOF POWER CONVERTER COMPONENTS 9

Introduction to magnetic materials- hard and soft magnetic materials –types of cores , copper windings – Design of transformer –Inductor design equations –Examples of inductor design for buck/flyback converter-selection of output filter capacitors – selection of ratings for devices – input filter design.

UNITIV RESONANTDC-DCCONVERTERS 9

Switching loss, hard switching, and basic principles of soft switching- classification of resonant converters- load resonant converters – series and parallel – resonant switch converters– operation and analysis of ZVS, ZCS converters comparison of ZCS/ZVS-Introduction to ZVT/ZCT PWM converters.

UNITVAC-ACCONVERTERS 9

Principle of on-off and phase angle control – single phase ac voltage controller – analysis with R & RL load – Three phase ac voltage controller– principle of operation of cyclo converter – single phase and three phase cyclo converters – Introduction to matrix converters.

TOTAL:45 PERIODS

OUTCOMES:

Attheend ofthecoursethe studentwillbeableto:

- Analyzevarioussinglephaseandthreephasepowerconverters
- Selectanddesigndc-dcconvertertopologiesforabroadrangeofpowerconversion applications.
- Developimprovedpowerconvertersforanystringentapplicationrequirements.
- Designac-acconvertersforvariablefrequencyapplications.

TEXT BOOKS:

1 NedMohan,T.MUndelandandW.PRobbin, “PowerElectronics:converters,Application and design” John Wiley and sons.Wiley India edition, 2006.
2 RashidM.H.,“PowerElectronicsCircuits,DevicesandApplications",PrenticeHall India, Third Edition, New Delhi, 2004.
3 P.C.Sen,“ModernPowerElectronics”,WheelerPublishingCo,FirstEdition,New Delhi, 1998.
4 P.S.Bimbra,“PowerElectronics”,KhannaPublishers,EleventhEdition,2003
5 SimonAng,AlejandroOliva,“Power-SwitchingConverters,SecondEdition,CRCPress, Taylor & Francis Group, 2010
6 V.Ramanarayanan,“CoursematerialonSwitchedmodepowerconversion”,2007
7 Alex Van den Bossche and VencislavCekovValchev, “Inductors and TransformersforPowerElectronics”, CRC Press, Taylor & Francis Group, 2005
8 W.G.HurleyandW.H.Wolfle,“TransformersandInductorsforPowerElectronics Theory, Design and Applications”, 2013 John Wiley & Sons Ltd.
9 Marian.K.KazimierczukandDariuszCzarkowski,“ResonantPowerConverters”,John Wiley & Sons limited, 2011

22272E23BP-MODELINGANDANALYSISOFELECTRICALMACHINES

3104

UNITIPRINCIPLESOFELECTROMAGNETICENERGYCONVERSION

Generalexpressionofstoredmagneticenergy-co-energyandforce/torque-exampleusing single and doubly excited system.

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UNITIIBASIC CONCEPTS OFROTATING 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.

UNITIIIINTRODUCTIONTOREFERENCEFRAME 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 theoryof rotating electrical machine and Kron’s primitive machine.

UNITIVDETERMINATIONOFSYNCHRONOUSMACHINEDYNAMIC EQUIVALENT CIRCUIT PARAMETERS

Standard and derived machine time constants - frequency response test - analysis and dynamicmodeling of two phase asymmetrical induction machine and single phase induction machine.

UNITVSPECIALMACHINES

Permanent magnet synchronous machine- surface permanent magnet (square and sinusoidal back E.M.F. type) and interior permanent magnet machines - construction andoperating principle - dynamic modeling and self controlled operation - analysis of switchreluctance motors.

L= 45T = 15P= 0C=4

TEXT BOOKS

1. CharlesKingsley,A.E.FitzgeraldJr.andStephenD.Umans,‘ElectricMachinery’,Tata McGraw-Hill, Fifth Edition, 1992.

2. R.Krishnan,‘ElectricMotor&Drives:Modelling,AnalysisandControl’,PrenticeHallof India, 2001.

REFERENCES

1. C.V.Jones,‘TheUnifiedTheoryofElectricalMachines’,Butterworth,1967.

2. T.J.E.Miller,‘BrushlessPermanentMagnetandReluctanceMotorDrives’Clarendon Press, 1989.

22272E51BP ADVANCED POWER SYSTEM DYNAMICS LTPC
OBJECTIVES: 30 0 3

- Toperformtransientstabilityanalysisusingunifiedalgorithm.
- Toimpartknowledgeonsub-synchronousresonanceandoscillations
- Toanalyzevoltagestabilityprobleminpowersystem.
- Tofamiliarizethemethodsoftransientstabilityenhancement

UNITITRANSIENTSTABILITYANALYSIS 9

Review of numerical integration methods: Euler and Fourth Order Runge-Kutta methods, Numerical stability and implicit methods, Interfacing of Synchronous machine (variable voltage) model to the transient stability algorithm (TSA) with partitioned – explicit and implicit approaches – Interfacing SVC with TSA-methods to enhance transient stability

UNITII UNIFIEDALGORITHMFORDYNAMICANALYSISOFPOWERSYSTEMS 9

Need for unified algorithm- numerical integration algorithmic steps-truncation error-variable step size – handling the discontinuities- numerical stability- application of the algorithm for transient. Mid-term and long-term stability simulations

UNITIII SUBSYSNCHRONOUSRESONANCE(SSR)ANDOSCILLATIONS 9

Subsynchronous Resonance (SSR) – Types of SSR - Characteristics of series –Compensated transmission systems –Modeling of turbine-generator-transmission network- Self-excitation due to induction generator effect – Torsional interaction resulting in SSR – Methods of analyzing SSR – Numerical examples illustrating instability of subsynchronous oscillations – time-domain simulation of subsynchronous resonance – EMTP with detailed synchronous machine model- Turbine Generator Torsional Characteristics: Shaft system model – Examples of torsional characteristics – Torsional Interaction with Power System Controls:Interaction with generator excitationcontrols –Interaction with speed governors – Interaction with nearby DC converters

UNIT IV TRANSMISSION, GENERATION ANDLOAD ASPECTS OF VOLTAGE STABILITYANALYSIS 9

Review of transmission aspects – Generation Aspects: Review of synchronous machine theory – Voltage and frequency controllers – Limiting devices affecting voltage stability – Voltage-reactive power characteristics of synchronous generators – Capability curves – Effect of machine limitation on deliverable power – Load Aspects – Voltage dependence of loads – Load restoration dynamics – Induction motors – Load tap changers – Thermostatic load recovery – General aggregate load models.

UNIT V ENHANCEMENTOFTRANSIENTSTABILITYANDCOUNTERMEASURES FOR SUB SYNCHRONOUS RESONANCE 9

Principle behind transient stability enhancement methods: high-speed fault clearing, reduction of transmission system reactance, regulated shunt compensation, dynamic braking, reactor switching, independent pole-operation of circuit-breakers, single-pole switching, fast-valving, high-speed excitation systems; NGH damper scheme.

TOTAL:45PERIODS

OUTCOMES:

- Learners will be able to understand the various schemes available in Transformer protection
- LearnerswillhaveknowledgeonOvercurrentprotection.
- Learners willattainknowledgeaboutDistanceand Carrierprotectionin transmission lines.
- LearnerswillunderstandtheconceptsofBusbarprotection.
- Learnerswillattainbasicknowledgeonnumericalprotectiontechniques

REFERENCES

1 R.Ramnujam," Power System Dynamics Analysis and Simulation", PHI Learning Private Limited, New Delhi, 2009

2 T.V. CutsemandC.Vournas,"VoltageStability of ElectricPowerSystems",Kluwer publishers,1998

3 P.Kundur,"PowerSystemStabilityandControl",McGraw-Hill,1993.

4 H.W. Dommel and N.Sato, "Fast Transient Stability Solutions," IEEE Trans., Vol. PAS-91, pp, 1643-1650, July/August 1972.

5 RoderickJ.FrowdandJ.C.Giri,"TransientstabilityandLongtermdynamics unified",IEEETrans.,Vol101,No.10,October 1982.

6 M.Stubbe, A.Bihain,J.Deuse, J.C.Baader, "A New Unified software program for the study of the dynamic behaviour of electrical power system" IEEETransaction, Power Systems, Vol.4.No.1,Feb:1989 Pg.129 to 138

22272E23DP ANALYSIS AND COMPUTATION OF ELECTROMAGNETICTRANSIENTSINPOWERSYSTEMS

LTPC

OBJECTIVES: **3003**

- Tounderstandthevarioustypesoftransientsanditsanalysisinpowersystem.
- Tolearnaboutmodelingandcomputationalaspectstransientscomputation

UNITI REVIEWOFTRAVELLINGWAVE PHENOMENA 9

Lumped and Distributed Parameters – Wave Equation – Reflection, Refraction,Behaviour of Travelling waves at the line terminations – Lattice Diagrams – Attenuation and Distortion.

UNITII LIGHTNING,SWITCHINGANDTEMPORARYOVERVOLTAGES 9

Lightning overvoltages: interaction between lightning and power system- ground wire voltage and voltage across insulator; switching overvoltage: Short line or kilometric fault, energizing transients - closing and re-closing of lines, methods of control; temporary overvoltages: line dropping, load rejection; voltage induced by fault; very fast transient overvoltage (VFTO).

UNITIII PARAMETERSANDMODELINGOFOVERHEADLINES 9

Review of line parameters for simple configurations: series resistance, inductance and shunt capacitance; bundle conductors : equivalent GMR and equivalent radius; modal propagation in transmission lines: modes on multi-phase transposed transmission lines, α-β-0 transformation and symmetrical components transformation, modal impedances; analysis of modes on untransposed lines; effect of ground return and skin effect; transposition schemes;

UNITV FASTTRANSIENTSPHENOMENONINAISANDGIS 9

Digital computation of line parameters: why line parameter evaluation programs? Salient features of a typical line parameter evaluation program; constructional features of that affect transmission line parameters; line parameters for physical and equivalent phase conductors elimination of ground wires bundling of conductors; principle of digital computation of transients: features and capabilities of electromagnetic transients program; steady state and time step solution modules: basic solution methods; case studies on simulation of various types of transients

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillbeabletomodeloverheadlines,cablesandtransformers.
- Learnerswillbeabletoanalyzepowersystemtransients.

REFERENCES

1 AllanGreenwood,“ElectricalTransientsinPowerSystem”,Wiley&SonsInc.NewYork, 1991.
2 R.Ramanujam,“ComputationalElectromagneticTransients:Modeling,SolutionMethods and Simulation”, I.K. International Publishing House Pvt. Ltd, New Delhi, 2014.
3 NaiduMSandKamarajuV,“HighVoltageEngineering”,TataMcGraw-HillPublishing Company Ltd., New Delhi, 2004.

22272E33AP SMARTGRID LTPC

3003

OBJECTIVES:

- To Study about SmartGrid technologies, different smartmeters and advanced metering infrastructure.
- Tofamiliarizethepowerqualitymanagement issuesinSmartGrid.
- TofamiliarizethehighperformancecomputingforSmartGridapplications

UNITIINTRODUCTIONTOSMARTGRID 9

EvolutionofElectricGrid, Concept, Definitionsand Need forSmartGrid, Smart grid drivers, functions, opportunities, challenges andbenefits, Differencebetweenconventional&Smart Grid, National and International Initiatives in Smart Grid.

UNITII SMARTGRIDTECHNOLOGIES 9

Technology Drivers, Smart energy resources, Smart substations, Substation Automation, Feeder Automation ,Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/Var control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

UNITIII SMARTMETERSANDADVANCEDMETERINGINFRASTRUCTURE 9

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) driversand benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit(PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

UNITIV POWERQUALITYMANAGEMENTINSMARTGRID 9

Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.

UNITV HIGHPERFORMANCECOMPUTINGFORSMARTGRIDAPPLICATIONS9

Local Area Network (LAN), House Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing to make Smart Grids smarter, Cyber Security for Smart Grid.

TOTAL:45 PERIODS

OUTCOMES:

- Learnerswilldevelopmoreunderstandingontheconceptsof SmartGridand its present developments.
- LearnerswillstudyaboutdifferentSmartGridtechnologies.
- Learnerswillacquireknowledgeaboutdifferentsmartmetersandadvanced metering infrastructure.
- LearnerswillhaveknowledgeonpowerqualitymanagementinSmartGrids
- LearnerswilldevelopmoreunderstandingonLAN,WANandCloud Computing for Smart Grid application

REFERENCES

1 StuartBorlase“SmartGrid:Infrastructure,TechnologyandSolutions”,CRCPress 2012.

2 JanakaEkanayake,NickJenkins,KithsiriLiyanage,JianzhongWu,AkihikoYokoyama, “SmartGrid:TechnologyandApplications”,Wiley2012.

3 Vehbi C. Güngör, DilanSahin, TaskinKocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P. Hancke, “Smart Grid Technologies: Communication TechnologiesandStandards”IEEETransactionsOnIndustrialInformatics,Vol. 7, No. 4, November 2011.

4 XiFang,SatyajayantMisra,GuoliangXue,andDejunYang“SmartGrid–TheNew and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids, vol. 14, j2012.

22272E33BP SOLARANDENERGYSTORAGESYSTEMS LTPC

3003

OBJECTIVES:

- ToStudyaboutsolarmodulesand PVsystemdesignandtheirapplications
- ToDealwithgridconnectedPVsystems
- ToDiscussaboutdifferentenergystoragesystems

UNITIINTRODUCTION 9

Characteristicsofsunlight–semiconductorsandP-Njunctions–behaviorofsolarcells–cellproperties–PVcellinterconnection

UNITII STANDALONEPV SYSTEM 9

Solarmodules– storagesystems–powerconditioningandregulation-MPPT- protection–stand alonePVsystemsdesign–sizing

UNITIII GRIDCONNECTEDPVSYSTEMS 9

PVsystemsinbuildings–designissuesforcentralpowerstations–safety–Economic aspect – Efficiency and performance - International PV programs

UNITIV ENERGYSTORAGE SYSTEMS 9

Impactofintermittentgeneration–Batteryenergystorage–solarthermalenergystorage –pumpedhydroelectricenergystorage

UNITV APPLICATIONS 9

Waterpumping–batterychargers–solarcar–direct-driveapplications–Space–Telecommunications.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldevelopmoreunderstandingonsolarenergystoragesystems
- StudentswilldevelopbasicknowledgeonstandalonePVsystem
- Studentswillunderstandtheissuesingrid connectedPVsystems
- Studentswillstudyaboutthemodelingofdifferentenergystoragesystems and their performances
- Studentswillattainmoreondifferentapplicationsofsolarenergy

REFERENCES

1 SolankiC.S.,"SolarPhotovoltaics:Fundamentals,TechnologiesAndApplications", PHILearning Pvt.Ltd.,2015.

2 Stuart R.Wenham, Martin A.Green, Muriel E. Watt and Richard Corkish, "Applied Photovoltaics",2007,Earthscan,UK.EduardoLorenzoG.Araujo,"Solarelectricity engineering of photovoltaic systems", Progensa,1994.

3 FrankS.Barnes&JonahG.Levine,"LargeEnergystorageSystemsHandbook",CRC Press, 2011.

4 McNeils,Frenkel,Desai,"Solar&WindEnergyTechnologies",WileyEastern, 1990

5 S.P.Sukhatme,"SolarEnergy",TataMcGrawHill,1987.

22272E33CP POWER SYSTEM RELIABILITY L T P C

OBJECTIVES: 3 0 0 3

- TointroducestheobjectivesofLoadforecasting.
- TostudythefundamentalsofGenerationsystem,transmissionsystemand Distribution system reliability analysis
- ToillustratethebasicconceptsofExpansionplanning

UNITI LOADFORECASTING 9

Objectivesofforecasting-Loadgrowthpatternsandtheirimportanceinplanning-Load forecasting Based on discounted multiple regression technique-Weather sensitive load forecasting-Determination of annual forecasting-Use of AI in load forecasting.

UNITII GENERATIONSYSTEMRELIABILITYANALYSIS 9

Probabilisticgenerationandloadmodels-DeterminationofLOLPandexpectedvalueof demand not served –Determination of reliability of ISO and interconnected generation systems

UNITIII TRANSMISSIONSYSTEMRELIABILITYANALYSIS 9

Deterministic contingency analysis-probabilistic load flow-Fuzzy load flow probabilistic transmissionsystemreliabilityanalysis-DeterminationofreliabilityindiceslikeLOLPand expected value of demand not served

UNITIV EXPANSIONPLANNING 9

Basicconceptsonexpansionplanning-procedurefollowedforintegratetransmission system planning, current practice in India-Capacitor placer problem in transmission system and radial distributions system.

UNITV DISTRIBUTIONSYSTEMPLANNINGOVERVIEW 9

Introduction, sub transmission lines and distribution substations-Design primary and secondarysystems-distributionsystemprotectionandcoordinationofprotectivedevices.

TOTAL:45PERIODS

OUTCOMES:

- Studentswilldeveloptheabilitytolearnaboutloadforecasting.
- StudentswilllearnaboutreliabilityanalysisofISOandinterconnectedsystems.
- StudentswillunderstandtheconceptsotContingencyanalysisandProbabilistic Load flow Analysis
- StudentswillbeabletounderstandtheconceptsofExpansionplanning

- StudentswillhaveknowledgeonthefundamentalconceptsoftheDistribution system planning

REFERENCES

1 RoyBillinton&RonaldN.Allan,“ReliabilityEvaluationofPowerSystems”Springer Publication,

2 R.L.Sullivan,“PowerSystemPlanning”,TataMcGrawHillPublishingCompany Ltd 1977.

3 X.Wang&J.R.McDonald,“ModernPowerSystemPlanning”,McGrawHillBook Company 1994.

4 T.Gonen,“ElectricalPowerDistributionEngineering”,McGrawHillBookCompany 1986.

5 B.R.Gupta,“GenerationofElectricalEnergy”,S.ChandPublications1983.

22272E33DPDISTRIBUTED GENERATION AND MICROGRID LTPC

OBJECTIVES: 3003

- Toillustratetheconceptofdistributedgeneration
- Toanalyzetheimpactofgridintegration.
- TostudyconceptofMicrogridanditsconfiguration

UNITI INTRODUCTION 9

Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNITII DISTRIBUTEDGENERATIONS(DG) 9

Concept of distributed generations, topologies, selection of sources, regulatory standards/ framework, StandardsforinterconnectingDistributed resourcestoelectricpowersystems: IEEE 1547. DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, flywheels. Captive power plants

UNITIII IMPACTOFGRIDINTEGRATION 9

Requirements for grid interconnection, limits on operational parameters,: voltage, frequency, THD, response to grid abnormal operating conditions, islandingissues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNITIV BASICSOFA MICROGRID 9

Concept and definition of microgrid, microgrid drivers and benefits, review of sources of microgrids, typical structure and configuration of a microgrid, AC and DCmicrogrids, Power Electronics interfaces in DC and AC microgrids

UNITV CONTROLANDOPERATIONOFMICROGRID 9

Modesofoperationandcontrolofmicrogrid:grid connected and islanded mode,Activeand reactive power control, protection issues, anti-islanding schemes: passive, active and communication based techniques, microgrid communication infrastructure, Power quality issues in microgrids, regulatory standards, Microgrid economics, Introduction to smart microgrids.

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillattainknowledgeonthevariousschemesofconventionaland nonconventional power generation.

- Learnerswillhaveknowledgeonthetopologiesandenergysourcesofdistributed generation.
- Learnerswilllearnabouttherequirementsforgridinterconnectionanditsimpact with NCE sources
- Learnerswillunderstandthefundamentalconceptof Microgrid.

REFERENCES

1 AmirnaserYezdani,andRezaIravani,"VoltageSourceConvertersinPowerSystems: Modeling, Control and Applications", IEEE John Wiley Publications, 2010.

2 DorinNeacsu,"PowerSwitchingConverters:MediumandHighPower",CRCPress, Taylor & Francis, 2006

3 ChetanSinghSolanki,"SolarPhotoVoltaics",PHIlearningPvt.Ltd.,NewDelhi,2009

4 J.F.Manwell,J.G.McGowan"WindEnergyExplained,theorydesignand applications",Wileypublication2010.

5 D.D.HallandR.P.Grover,"BiomassRegenerableEnergy",JohnWiley,NewYork, 1987.

6 JohnTwidellandTonyWeir,"RenewableEnergyResources"TyalorandFrancis Publications, Second edition 2006.

22272E43AP-WINDENERGYCONVERSIONSYSTEMS

3104

UNIT-IINTRODUCTION: **9**

HistoryofwindElectricgeneration-Darrieuswind-Horizontalandverticalaxis-Windturbine- other modern developments - Future possibilities.

UNIT-IIWINDRESOURCEANDITSPOTENTIALFORELECVTRICPOWER GENERATION: **9**

PowerExtractedByAWindDrivenMachine -Natureandoccurrenceofwind characteristicsandpowerproduction-variationofmeanwindspeedwithtime.

UNIT-IIIWINDPOWERSITESANDWINDMEASUREMENTS: **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 CONTROLASPECTS: **9**

Asynchronoussystems-AcGenerators-SelfexcitationofInductionGenerator-SinglePhaseoperationofInductionGenerator-PermanenetmagnetGenerators-Basiccontrolaspects-fixedspeedratiocontrolscheme-fixedvsvariablespeed operation of WECS.

UNIT-VGENERATIONOFELECTRICITY **9**

Active and reactive power - P and Q transfer in power systems - Power converters - Characteristics of Generators - Variable Speed options - Economics.

L= 45T=15P=0C=4

REFERENCES:

1. N.G.Calvert,'WindPowerPrinciples:TheirApplicationonsmallscale',Charles Friffin& co. Ltd, London, 1979.
2. Gerald W.Koeppel, "Pirnam's and Power fromthe wind", Van Nastran Reinhold Co., London, 1979.
3. GaryL.Johnson,"WindEnergySystem",PrenticehallInc.,EnglewoodCliffs,New Jersey, 1985.
4. WindenergyconversionsystembyL.Lfreris,Prenticehall(U.K)Ltd.,1990.

22272E43BP -AITECHNIQUESTOPOWERSYSTEMS

3104

1. **INTRODUCTIONTO NEURAL NETWORKS 9**
   BasicsofANN-perceptron-deltalearningrule- backpropagationalgorithm -multilayerfeed forward network - memory models - bi-directional associative memory- Hopfield network.

2. **APPLICATIONSTOPOWERSYSTEMPROBLEMS 9**
   Application of neural networks to load forecasting - contingency analysis - VAR control - economic load dispatch.

3. **INTRODUCTIONTO FUZZYLOGIC 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 TOPOWER 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. **GENETICALGORITHMANDITSAPPLICATIONSTOPOWERSYSTEMS 9**
   Introduction-simplegeneticalgorithm-reproduction-crossover-mutation–advanced operators in genetic search - applications to voltage control and stability studies.

L= 45T= 15P= 0C =4

REFERENCES:

1. James A. Freeman and Skapura.B.M „Neural Networks - Algorithms Applications andProgramming Techniques‟, Addison Wesley, 1990.
2. George Klirand Tina Folger.A„„Fuzzy sets,Uncertainty andInformation‟,Prentice Hall of India, 1993.
3. Zimmerman.H.J„„Fuzzy SetTheory andits Applications‟, Kluwer Academic Publishers 1994.
4. IEEEtutorialon„ApplicationofNeuralNetworktoPowerSystems‟,1996.
5. LoiLeiLai„„IntelligentSystemApplicationsinPowerEngineering‟,John Wiley&SonsLtd.,1998.

22272E43CP ELECTRICAL DISTRIBUTION SYSTEM LTPC

OBJECTIVES: 3003

- Toprovide knowledge about thedistributionsystemelectricalcharacteristics
- To gainknowledgeaboutplanningand designingofdistributionsystem
- Toanalyzepowerqualityindistributionsystem
- Toanalyzethepowerflowinbalancedandunbalancedsystem

UNITI INTRODUCTION 9

Distribution System-Distribution Feeder Electrical Characteristics-Nature of Loads : IndividualCustomerLoad,DistributionTransformerLoadingandFeederLoad-Approximate MethodofAnalysis:VoltageDrop,LineImpedance,“K”Factors,UniformlyDistributedLoads and Lumping Loads in Geometric Configurations.

UNITII DISTRIBUTIONSYSTEM PLANNING 9

Factors effecting planning, present techniques, planning models(Short term planning, long term planning and dynamic planning), planning in the future, future nature of distribution planning,RoleofcomputerinDistributionplanning.Loadforecast,Loadcharacteristicsand Load models.

UNITIII DISTRIBUTIONSYSTEM LINEMODEL 9

Exact LineSegmentModel-ModifiedLine Model-ApproximateLineSegmentModel-Modified “Ladder”IterativeTechnique-General MatricesforParallelLines.

UNITIV VOLTAGEREGULATION 9

Standard Voltage Ratings-Two-Winding Transformer Theory-Two-Winding Autotransformer-Step-Voltage Regulators: Single-Phase Step-Voltage Regulators-Three-Phase Step-Voltage Regulators- Application of capacitors in Distribution system.

UNITV DISTRIBUTIONFEEDERANALYSIS 9

Power-Flow Analysis- Ladder Iterative Technique -Unbalanced Three-Phase Distribution Feeder-ModifiedLadderIterativeTechnique-LoadAllocation-Short-CircuitStudies.

TOTAL:45PERIODS

OUTCOMES:

- Abilitytoapplytheconceptsofplanninganddesignofdistributionsystemforutility systems
- Abilitytoimplementtheconcepts ofvolatagecontrolindistributionsystem.
- Abilitytoanalyzethepowerflowinbalancedandunbalancedsystem

REFERENCES

1. WilliamH.Kersting,"DistributionSystemModelingandAnalysis"CRCpress3rd edition,2012.
2. Turan Gonen, “ElectricPower Distribution System Engineering”, McGraw Hill Company. 1986
3. James Northcote – Green, Robert Wilson, “Control and Automation of Electrical PowerDistribution Systems”, CRC Press, New York, 2007.
4. PablaHS,“ElectricalPowerDistributionSystems”,TataMcGrawHill.2004

22272E43DP-ENERGY MANAGEMENT AND AUDITING L T P C

OBJECTIVES: 3003

- Tostudytheconceptsbehindeconomicanalysisand Loadmanagement.
- Toemphasizetheenergymanagement onvarious electricalequipmentsandmetering.
- Toillustratethe conceptoflightingsystemsandcogeneration.

UNITI INTRODUCTION 9

Needforenergymanagement-energybasics-designingandstartinganenergymanagement program – energy accounting -energy monitoring, targeting and reporting-energy audit process.

UNITII ENERGYCOSTANDLOADMANAGEMENT 9

Importantconceptsinaneconomicanalysis-Economicmodels-Timevalueofmoney-Utility rate structures- cost of electricity-Loss evaluation- Load management: Demand control techniques-Utilitymonitoringandcontrolsystem-HVACandenergymanagement-Economic justification.

UNITIII ENERGYMANAGEMENTFORMOTORS,SYSTEMS,ANDELECTRICAL EQUIPMENT 9

Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronousmachines.

UNITIV METERINGFOR ENERGYMANAGEMENT 9

Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements- Metering techniques and practical examples.

UNITV LIGHTINGSYSTEMS&COGENERATION 9

Concept of lighting systems - The task and the working space -Light sources - Ballasts - Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards Cogeneration:Formsofcogeneration- feasibilityof cogeneration-Electrical interconnection.

TOTAL:45PERIODS

OUTCOMES:

- Students willdeveloptheability tolearn abouttheneedforenergy managementand auditingprocess
- Learnerswilllearnaboutbasicconceptsofeconomicanalysis andload management.
- Studentswillunderstand theenergymanagementonvariouselectricalequipments.
- Students will have knowledge on the concepts of metering and factors influencing cost function

- Students willbe able tolearnaboutthe conceptof lightingsystems, lightsourcesand various forms of cogeneration

REFERENCES

1 BarneyL.Capehart,WayneC.Turner,andWilliamJ.Kennedy,“GuidetoEnergy Management”,FifthEdition,TheFairmontPress,Inc.,2006
2 EastopT.D&CroftD.R,“EnergyEfficiencyforEngineersandTechnologists”,Logman Scientific & Technical, 1990.
3 ReayD.A,“IndustrialEnergyConservation”,1st edition,PergamonPress,1977.
4 “IEEERecommendedPracticeforEnergyManagementinIndustrialandCommercial Facilities”, IEEE, 1996
5 AmitK. Tyagi,“HandbookonEnergyAuditsandManagement”,TERI,2003.

22272E51AP-POWERELECTRONICSAPPLICATIONSINPOWERSYSTEMSLTPC

3104

UNIT:ISTATICCOMPENSATORCONTROL 9

Theoryof load compensation - voltage regulation and power factorcorrection - phase balance and PF correctionofunsymmetrical loads - Propertyofstatic compensator - Thyristor controlled rectifier (TCR) - Thyristor Controlled Capacitor (TSC) -Saturable core reactor - Control Strategies.

UNIT:IIHARMONICCONTROLANDPOWERFACTORIMPROVEMENT 9

Inputpower factor fordifferenttypes of converters-power factor improvementusingLoad and forced commutated converters.

UNIT:IIIVOLTAGECONTROLUSINGSTATICTAP-CHANGERS 9

Conventional tap changing methods, static tap changers using Thyristor,different schemes - comparison.

UNIT:IVSTATICEXCITATIONCONTROL 9

Solidstateexcitationofsynchronousgenerators-Differentschemes-Generexexcitation systems.

UNIT:VUNINTERRUPTABLEPOWERSUPPLYSYSTEM 9

Parallel,Redundantand non- redundant UPS-Upsusingresonant power converters- Switch mode power supplies.

L = 45T = 15P= 0C =4

TEXTBOOK

Miller. T.J.E, “Reactive power control in Electric systems”. Wiley interscience,New York,1982.

REFRENCES

1. “StaticCompensatorforACpowersystems”,Proc.IEEvol.128Nov.1981.pp 362-406.
2 “AStaticalternativetothetransformeronloadtapchanging”,IEEETrans. On Pas, Vol.PAS-99, Jan. /Feb. 1980, pp86-89.
3. “ImprovementsinThyristorcontrolledstaticon-loadtapcontrollersfortransformers”, IEEETrans.onPAS,Vol.PAS-101,Sept.1982,pp3091-3095.
4. “ShuntThyristorrectifiersfortheGenerexExcitationsystems”,IEEETrans.On PAS. PAS -96, July/August, 1977, pp1219-1325.

22272E32B-POWERSYSTEMDYNAMICS

3104

1. SYNCHRONOUSMACHINEMODELLING 9

Schematic Diagram, Physical Description: armature and field structure, machines with multiple pole pairs, mmf waveforms, direct and quadrature axes, Mathematical Description of a Synchronous Machine: Basic equations of a synchronous machine:stator circuit equations, stator self, stator mutual and stator to rotor mutual inductances, dq0 Transformation: flux linkageandvoltage 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 RepresentationinStabilityStudies:Simplificationsforlarge-scalestudies:Neglectofstator$p\Psi$ terms and speed variations, Simplified model with amortisseurs neglected: two-axis model with amortisseur windings neglected, classical model.

2. MODELLINGOFEXCITATIONANDSPEEDGOVERNINGSYSTEMS 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-SIGNALSTABILITYANALYSISWITHOUTCONTROLLERS 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 systemstability: analysis with numerical example,

4. SMALL-SIGNALSTABILITYANALYSISWITHCONTROLLERS 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: Equationsinacommon 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. ENHANCEMENTOFSMALLSIGNALSTABILITY 9

Power System Stabilizer – Stabilizer based on shaft speed signal (delta omega) – Delta –P-Omega stabilizer-Frequency-basedstabilizers – Digital Stabilizer – Excitationcontrol design – Exciter gain– Phaselead compensation – Stabilizing signal washout stabilizer gain – Stabilizer limits

L = 45T = 15P= 0C =4

REFERENCES

1. P.Kundur,"PowerSystemStabilityandControl",McGraw-Hill,1993.
2. IEEECommitteeReport,"DynamicModelsforSteamandHydroTurbinesin Power System Studies", IEEE Trans., Vol.PAS-92, pp 1904-1915, November/December, 1973. on Turbine-Governor Model.
3. P.MAndersonandA.AFouad,"PowerSystemControlandStability",IowaState University Press, Ames, Iowa, 1978.

22272E51CP ELECTRICVEHICLESANDPOWERMANAGEMENT **LT P C**
30 0 3

OBJECTIVES:

- Tounderstandtheconceptofelectricalvehiclesanditsoperations
- Tounderstandtheneedforenergystorageinhybridvehicles
- Toprovideknowledgeaboutvariouspossibleenergystoragetechnologiesthatcanbe
- usedinelectricvehicles

UNIT I ELECTRICVEHICLESANDVEHICLEMECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics

UNITII ARCHITECTUREOFEV'sANDPOWERTRAINCOMPONENTS 9

Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV)- Powertrain components and sizing, Gears, Clutches, Transmission and Brakes

UNITIII CONTROLOFDC ANDACDRIVES 9

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motorandpermanent motor based vector control operation – Switched reluctance motor (SRM) drives

UNITIV BATTERYENERGYSTORAGESYSTEM 9

BatteryBasics,Differenttypes,BatteryParameters,Batterymodeling,TractionBatteries

UNIT V ALTERNATIVEENERGYSTORAGESYSTEMS 9

Fuelcell–Characteristics-Types–hydrogenStorageSystemsandFuelcellEV–Ultracapacitors

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillunderstandtheoperationof Electricvehiclesandvariousenergystorage technologies for electrical vehicles

REFERENCES

1 IqbalHussain,"**ElectricandHybridVehicles:DesignFundamentals,Second Edition"**CRCPress,Taylor&FrancisGroup,SecondEdition(2011).

2 AliEmadi,MehrdadEhsani,JohnM.Miller,"VehicularElectricPowerSystems",Special Indian Edition, Marcel dekker, Inc 2010.

22272E51DP	ELECTROMAGNETICINTERFERENCEAND COMPATIBILITY	L	T	P	C
		3	0	0	3

OBJECTIVES:

- Toprovidefundamentalknowledgeonelectromagneticinterferenceand electromagnetic compatibility.
- TostudytheimportanttechniquestocontrolEMIand EMC.
- ToexposetheknowledgeontestingtechniquesasperIndianandinternational standards in EMI measurement.

UNIT I INTRODUCTION 9

Definitions of EMI/EMC -Sources of EMI- Intersystems and Intrasystem- Conducted and radiated interference- Characteristics - Designing for electromagnetic compatibility (EMC)- EMC regulationtypical noise path- EMI predictions and modeling, Cross talk - Methods of eliminating interferences.

UNITII GROUNDINGANDCABLING 9

Cabling- types of cables, mechanism of EMI emission / coupling in cables –capacitive couplinginductive coupling- shielding to prevent magnetic radiation- shield transfer impedance, Grounding – safety grounds – signal grounds- single point and multipoint ground systemshybrid grounds- functional ground layout –grounding of cable shields- -guard shields- isolation, neutralizing transformers, shield grounding at high frequencies, digital grounding- Earth measurement Methods

UNITIII BALANCING,FILTERINGANDSHIELDING 9

Power supply decoupling- decoupling filters-amplifier filtering –high frequencyfiltering-EMI filters characteristics of LPF, HPF, BPF, BEF and power line filter design -Choice of capacitors, inductors, transformers and resistors, EMC design components -shielding – near and far fieldsshielding effectiveness - absorption and reflection loss- magnetic materials as a shield, shield discontinuities, slots and holes, seams and joints, conductive gaskets-windows and coatings - grounding of shields

UNITIVEMIINELEMENTSANDCIRCUITS 9

Electromagnetic emissions, noise from relays and switches, non- linearities in circuits, passiveinter modulation, transients in power supply lines, EMI from power electronic equipment, EMI as combination of radiation and conduction

UNIT V ELECTROSTATICDISCHARGE,STANDARDSANDTESTING TECHNIQUES 9

Static Generation- human body model- static discharges- ESD versus EMC, ESD protection in equipments- standards – FCC requirements – EMI measurements – Open area test site measurements and precautions- Radiated and conducted interference measurements, Control requirements and testing methods

TOTAL: 45 PERIODS

OUTCOMES:

- RecognizethesourcesofConductedandradiatedEMIinPowerElectronicConvertersand consumer appliances and suggest remedial measures to mitigate the problems
- AssesstheinsertionlossanddesignEMIfilterstoreducetheloss
- DesignEMIfilters,common-modechokesandRC-snubbercircuitsmeasurestokeepthe interference within tolerable limits

REFERENCES

1. V.P.Kodali,“EngineeringElectromagneticCompatibility”,S. Chand,1996
2. HenryW.Ott,“Noisereductiontechniquesinelectronicsystems”,JohnWiley& Sons, 1989
3. BernhardKeiser,“PrinciplesofElectro-magneticCompatibility”,ArtechHouse,Inc. (685cantonstreet,Norwood,MA020062USA) 1987
4. Bridges,J.E Milleta J.andRicketts.L.W.,“EMPRadiationandProtectivetechniques”, JohnWileyandsons,USA1976
5. WilliamDuffG.,&DonaldWhiteR.J,“SeriesonElectromagneticInterferenceand Compatibility”, Vol.
6. WestonDavidA.,“ElectromagneticCompatibility,PrinciplesandApplications”, 1991.

ELECTIVES–V(semester-III)

22275E52AP-POWERCONDITIONING

3104

1. INTRODUCTION 9

Introduction – Characterization of Electric Power Quality: Transients, short duration and long duration voltage variations, Voltage imbalance, waveform distortion, Voltage fluctuations, Power frequency variation, Power acceptability curves – power quality problems: poor load power factor, Non linear and unbalanced loads, DC offset in loads, Notching in load voltage, Disturbance in supply voltage – Power quality standards.

2. NON-LINEARLOADS 9

SinglephasestaticandrotatingAC/DCconverters,ThreephasestaticAC/DCconverters, Batterychargers,Arcfurnaces,Fluorescentlighting,pulsemodulateddevices,Adjustable speed drives.

3. MEASUREMENTANDANALYSISMETHODS 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. ANALYSISANDCONVENTIONAL MITIGATIONMETHODS 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 frommeasuredsamples –Harmonicindices –Analysisofvoltagesag:DetoritEdisonsag score, Voltage sag energy, Voltage Sag Lost Energy Index (VSLEI)- Analysis of voltage flicker, Reduced duration and customer impact of outages, Classical load balancing problem: Open loop balancing, Closed loop balancing, current balancing, Harmonic reduction, Voltage sag reduction.

5. POWERQUALITY IMPROVEMENT 9

Utility-Customer interface –Harmonic filters: passive, Active and 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 = 45T= 15P= 0C =4

REFERENCES:

1. ArindamGhosh“PowerQualityEnhancementUsingCustomPowerDevices”, Kluwer Academic Publishers, 2002.
2. Heydt.G.T,“ElectricPowerQuality”,StarsinaCirclePublications, 1994(2ndedition)
3. Dugan.R.C,“ElectricalPowerSystemQuality”,TMH,2008.
4. Arrillga.A.JandNevilleR.Watson,PowerSystemHarmonics,JohnWileysecond Edition,2003.
5. DerekA.Paice,“Power electronicconverterharmonics”,JohnWiley&sons,1999.

ELECTIVES–V(semester-III)

22275E52BP–DEREGULATEDPOWERSYSTEM

3104

1. FUNDAMENTALSANDARCHITECTUREOFPOWERMARKETS 9

Deregulation of Electric utilities: Introduction-Unbundling-Wheeling- Reform motivations- Fundamentals of Deregulated Markets – Types (Future, Day-aheadand Spot)–Participating inMarkets(Consumerand ProducerPerspective) – bilateralmarkets – pool markets. Independent System Operator (ISO)-components-types of ISO - role of ISO - Lessons and Operating Experiences of Deregulated Electricity Markets in various Countries (UK, Australia, Europe, US, Asia).

2. TECHNICALCHALLENGES 9

Total Transfer Capability – Limitations - Margins – Available transfer capability (ATC) – Procedure - Methods to compute ATC – Static and Dynamic ATC – Effect of contingency analysis – Case Study. Concept of Congestion Management– Bid, Zonaland Node Congestion Principles – Inter and Intra zonal congestion – Generation Rescheduling - Transmission congestion contracts – Case Study.

3. TRANSMISSIONNETWORKSANDSYSTEMSECURITYSERVICES9

Transmission expansion in the New Environment – Introduction – Role of transmission planning – Physical Transmission Rights – Limitations – Flow gate - Financial Transmission Rights – Losses – Managing Transmission Risks – Hedging – Investment. Ancillary Services – Introduction – Describing Needs – Compulsory and Demand-side provision – Buying and Selling Ancillary Services – Standards.

4. MARKETPRICING 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. INDIANPOWER MARKET 9

Current Scenario – Regions – Restructuring Choices – StatewiseOperatingStrategies – Salient features of Indian Electricity Act 2003 – Transmission System Operator – Regulatory and Policy development in Indian power Sector – Opportunities for IPP and Capacity Power Producer. Availability based tariff – Necessity – Working Mechanism – Beneficiaries – Day Scheduling Process – Deviation from Schedule – Unscheduled Interchange Rate – System Marginal Rate – Trading Surplus Generation – Applications.

L = 45T= 15P= 0C =4

REFERENCES

1. KankarBhattacharya,MathH.J.BollenandJaapE.Daalder,“Operationof Restructured Power Systems”, Kluwer Academic Publishers, 2001
2. LoiLeiLai,“Power systemRestructuringandRegulation”, JohnWileysons, 2001.
3. Shahidehpour.Mand Alomoush.M, “Restructuring ElectricalPowerSystems”, Marcel Decker Inc., 2001.
4. StevenStoft,“PowerSystemEconomics”,Wiley–IEEEPress,2002
5. Daniel S. Kirschen and Goran Strbac, “ Fundamentals of Power System Economics”, John Wiley& Sons Ltd., 2004.
6. ScholarlyTransactionPapers andUtilitywebsites

22275E52CP	**CONTROLSYSTEMDESIGNFORPOWER ELECTRONICS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

OBJECTIVES:

- ToexploreconceptualbridgesbetweenthefieldsofControlSystemsandPower Electronics
- ToStudyControltheoriesandtechniquesrelevanttothedesignoffeedbackcontrollers in Power Electronics.

UNIT I MODELLINGOFDC-TO-DCPOWERCONVERTERS 9

ModellingofBuckConverter,BoostConverter,Buck-BoostConverter,CukConverter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,DoubleBuck-BoostConverter, Boost-Boost Converter General Mathematical Model for Power Electronics Devices.

UNITII SLIDINGMODECONTROLLERDESIGN 9

Variable Structure Systems. Single Switch Regulated Systems Sliding Surfaces,Accessibility of the Sliding Surface Sliding Mode Control Implementation of Boost Converter ,Buck-Boost Converter, Cuk Converter ,Sepic Converter, Zeta Converter, Quadratic Buck Converter ,Double Buck-Boost Converter, Boost-Boost Converter.

UNITIII APPROXIMATELINEARIZATIONCONTROLLERDESIGN 9

LinearFeedbackControl,PolePlacementbyFullStateFeedback,PolePlacementBasedon Observer Design ,Reduced Order Observers , Generalized Proportional IntegralControllers, Passivity Based Control , Sliding Mode Control Implementation of Buck Converter , Boost Converter ,Buck-Boost Converter.

UNITIV NONLINEARCONTROLLERDESIGN 9

Feedback Linearization Isidori's Canonical Form, Input-Output Feedback Linearization, State Feedback Linearization, Passivity Based Control , Full Order Observers , Reduced OrderObservers.

UNIT V PREDICTIVECONTROLOFPOWERCONVERTERS 9

BasicConcepts,Theory,andMethods,ApplicationofPredictiveControlin Power Electronics,AC-DC-ACConverterSystem,FaultsandDiagnosisSystemsinPower Converters.

TOTAL:45PERIODS

OUTCOMES:

- Abilitytounderstandanoverviewonmodernlinearandnonlinearcontrol strategies for power electronics devices
- Abilitytomodelmodernpowerelectronicconvertersforindustrialapplications
- Abilitytodesignappropriatecontrollersformodernpowerelectronicsdevices.

REFERENCES

1. HeberttSira-Ramírez,RamónSilva-Ortigoza,"ControlDesignTechniquesinPower Electronics Devices", Springer 2012

2. MaheshPatil,PankajRodey,"ControlSystemsforPowerElectronics:APractical Guide",SpringerIndia,2015.

3. BlaabjergJoséRodríguez,"AdvancedandIntelligentControlinPowerElectronics and Drives" , Springer, 2014
4. EnriqueAcha,VassiliosAgelidis,OlimpoAnaya,TJEMiller,"PowerElectronic Control in Electrical Systems", Newnes, 2002
5. MarijaD.AranyaChakrabortty,Marija,"ControlandOptimizationMethodsfor ElectricSmartGrids",Springer,2012.

22275E52DP PRINCIPLESOFEHVTRANSMISSION LTPC 3003

OBJECTIVES:

Toimpartknowledgeon,

- Typesofpowertransmissionandconfigurationsvariousparametersandvoltage gradients of transmission line conductors.
- ThedesignrequirementsofEHVACandDClines.

UNIT I INTRODUCTION 9

Standardtransmissionvoltages-ACandDC–differentlineconfigurations–averagevaluesof line parameters – power handling capacity and line loss – costs of transmission lines and equipment – mechanical considerations in line performance.

UNITII CALCULATIONOFLINEPARAMETERS 9

Calculation of resistance, inductance and capacitance for multi-conductor lines – calculation of sequence inductances and capacitances – line parameters for different modesofpropagation–effectofgroundreturn.

UNITIII VOLTAGEGRADIENTSOFCONDUCTORS 9

Charge-potential relations for multi-conductor lines – surface voltage gradient on conductors – gradient factors and their use – distribution of voltage gradient on sub conductorsofbundle-voltagegradientsonconductorsinthepresenceofgroundwireson towers-I2R loss and corona loss-RIV.

UNITIV ELECTROSTATICFIELDANDDESIGNOFEHVLINES 9

Effect of EHV line on heavy vehicles - calculation of electrostatic field of AC lines- effect of high field on humans, animals, and plants - measurement of electrostatic fields – electrostatic Induction in unenergised circuit of a D/C line - induced voltages in insulated ground wires - electromagnetic interference, Design of EHV lines.

UNIT V HVDCLINES

Introduction- Reliability and failure issues-Design-tower, ROW, clearances, insulators, electricalandmechanicalprotection-Maintenance-Controlandprotection-D.CElectricfield and Magnetic field -Regulations and guide lines-underground line design.

TOTAL:45PERIODS

OUTCOMES:

- Abilitytomodelthetransmissionlinesandestimatethevoltagegradientsandlosses
- AbilitytodesignEHVACandDCtransmissionlines

REFERENCES

1 Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, Second Edition, New Age International Pvt. Ltd., 2006.
2 PritindraChowdhari,“Electromagnetic transients inPowerSystem”, JohnWileyand Sons Inc., 2009.
3 SunilS.Rao,“EHV-AC,HVDCTransmission&DistributionEngineering”,ThirdEdition, Khanna Publishers, 2008.
4 WilliamH.Bailey,DeborahE.WeilandJamesR.Stewart,“AReviewonHVDCPower Transmission Environmental Issues”, Oak Ridge National Laboratory.

5 J.C Molburg, J.A. Kavicky, and K.C. Picel ,"A report on The design, Construction and operation of Long-distance High-Voltage Electricity Transmission Technologies" Argonne (National Laboratory) 2007.
6 "PowerEngineer'sHandbook",RevisedandEnlarged6thEdition,TNEBEngineers' Association,October2002.

ELECTIVES–VI(semester-III)

22272E53AP-SOFTWAREFORCONTROLSYSTEMDESIGN

3104

1. INTRODUCTIONTODESIGNANDCLASSICALPIDCONTROL

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. COMPENSATORDESIGN

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

ProgramsusingMATLABsoftware

L= 45T =15P= 0C=4

REFERENCES

1. MAPLEVProgrammingguide.
2. MATLABusermanual.
3. SIMULINKusermanual.
4. K.Ogatta,"ModernControlEngineering",PHI,1997.
5. DorfandBishop,"ModerncontrolEngineering', AddisonWesley,1998.

ELECTIVES–VI(semester-III)

22272E53BP-INDUSTRIALPOWERSYSTEMANALYSISANDDESIGN

LTPC 3104

UNITIMOTORSTARTING STUDIES 9

Introduction-Evaluation Criteria-Starting Methods-System Data-Voltage Drop Calculations-Calculationof Accelerationtime-MotorStarting withLimited-CapacityGenerators-Computer-Aided Analysis-Conclusions.

UNIT IIPOWERFACTORCORRECTIONSTUDIES 9

Introduction-System Description and Modeling-Acceptance Criteria-Frequency ScanAnalysis-Voltage Magnification Analysis-Sustained Overvoltages-Switching Surge Analysis- Back-to-Back Switching-Summary and Conclusions.

UNITIII HARMONICANALYSIS 9

Harmonic Sources-System Response to Harmonics-System Model for Computer-Aided Analysis-Acceptance Criteria-Harmonic Filters-Harmonic Evaluation-Case Study-Summary and Conclusions.

UNIT IV FLICKERANALYSIS 9

SourcesofFlicker-FlickerAnalysis-FlickerCriteria-DataforFlickeranalysis-CaseStudy-Arc Furnace Load-Minimizing the Flicker Effects-Summary.

UNIT V GROUNDGRID ANALYSIS 9

Introduction-Acceptance Criteria-Ground Grid Calculations-Computer-Aided Analysis - Improving the Performance of the Grounding Grids-Conclusions.

L = 45T= 15P= 0C=4

REFERENCES

1. RamasamyNatarajan,"Computer-AidedPowerSystemAnalysis",MarcelDekkerInc., 2002.

22272E53CP- SOFTCOMPUTINGTECHNIQUES LTPC

OBJECTIVES: 3003

- Toexposetheconceptsoffeedforwardneural networks.
- Toprovideadequateknowledgeaboutfeedbackneuralnetworks.
- Toteachabouttheconceptoffuzzinessinvolvedinvarioussystems.
- Toexposetheideasaboutgeneticalgorithm
- ToprovideadequateknowledgeaboutofFLCandNNtoolbox

UNITIINTRODUCTIONANDARTIFICIALNEURALNETWORKS9

Introduction to intelligent systems- Soft computing techniques- ConventionalComputing versus Swarm Computing - Classification of meta-heuristic techniques -Properties of Swarm intelligent Systems - Application domain - Discrete andcontinuous problems - Single objective and multi-objective problems-Neuron-Nerve structure and synapse- Artificial Neuron and its model- activation functions-Neuralnetworkarchitecture-singlelayerand multilayerfeed forward networks-McCulloch Pitts neuron model- perceptron model- Adaline and Madaline-multilayerperception model- back propogation learning methods- effect of learning rulecoefficient -backpropagation algorithm- factors affectingbackpropagation training-applications.

UNITIIARTIFICIALNEURAL NETWORKSANDASSOCIATIVEMEMORY9

Counterpropagationnetwork- architecture-functioning&characteristicsofcounterPropagation network- Hopfield/ Recurrent network configuration - stabilityconstraints associative memory and characteristics-limitations and applications-Hopfield v/s Boltzman machine- Adaptive Resonance Theory- Architecture-classifications- Implementation and training - Associative Memory.

UNITIII FUZZYLOGICSYSTEM 9

Introduction to crisp sets and fuzzy sets- basic fuzzy set operation and approximatereasoning. Introduction to fuzzy logic modeling and control-Fuzzificationinferencing and defuzzification-Fuzzy knowledge and rule bases-Fuzzymodelingand control schemes for nonlinear systems. Self organizing fuzzy logiccontrol-Fuzzy logic control for nonlinear time delay system.

UNITIV GENETICALGORITHM 9

Evolutionary programs – Genetic algorithms, geneticprogrammingand evolutionary programming - Genetic Algorithm versus Conventional Optimization Techniques - Genetic representations and selection mechanisms; Genetic operators- different types of crossover and mutation operators - Optimization problems using

GA-discreteandcontinuous-Singleobjectiveandmulti-objectiveproblems-Procedures in evolutionary programming.

UNITV HYBRIDCONTROLSCHEMES 9

Fuzzification and rulebase usingANN–Neurofuzzysystems-ANFIS – FuzzyNeuron - Optimization of membership function and rule base using Genetic Algorithm – Introduction to Support Vector Machine - Evolutionary Programming-ParticleSwarm Optimization - Case study– Familiarization of NN, FLC and ANFIS Tool Box.

TOTAL:45PERIODS

OUTCOMES:

- Will be able to know the basic ANN architectures, algorithms and their limitations.
- Alsowillbeabletoknowthedifferent operationsonthefuzzysets.
- WillbecapableofdevelopingANNbasedmodelsandcontrolschemesfor non-linear system.
- Will get expertise in the use of different ANN structures and online training algorithm.
- Will be knowledgeable to use Fuzzy logic for modeling and control of non-linear systems.
- WillbecompetenttousehybridcontrolschemesandP.S.Oandsupport vector Regressive.

TEXTBOOKS:

1. LaureneV.Fausett,“FundamentalsofNeuralNetworks:Architectures, Algorithms And Applications”, Pearson Education.
2. TimothyJ.Ross,“FuzzyLogicwithEngineeringApplications”WileyIndia, 2008.
3. ZimmermannH.J. "Fuzzyset theoryand itsApplications" Springer international edition, 2011.
4. DavidE.Goldberg,“GeneticAlgorithmsinSearch,Optimization,andMachine Learning”,PearsonEducation,2009.
5. W.T.Miller,R.S.SuttonandP.J.Webrose,“NeuralNetworksforControl”MIT Press”,1996.
6. T. Ross,“FuzzyLogic with Engineering Applications”, TataMcGraw Hill, New Delhi, 1995.
7. Ethem Alpaydin, “Introduction to Machine Learning (Adaptive Computation and Machine Learning Series)”, MIT Press, 2004.
8. CorinnaCortesandV.Vapnik,"Support -VectorNetworks,MachineLearning ”1995.

22272E53DP RESTRUCTURED POWER SYSTEM LTPC
OBJECTIVES: 3003

- Tointroducetherestructuringofpowerindustryandmarket models.
- Toimpartknowledgeonfundamentalconceptsofcongestionmanagement.
- Toanalyze the concepts oflocational marginalpricing and financial transmission rights.
- ToIllustrateaboutvariouspowersectorsin India

UNITIINTRODUCTIONTORESTRUCTURINGOFPOWERINDUSTRY 9

Introduction: Deregulation of power industry, Restructuring process, Issuesinvolved in deregulation, Deregulation of various power systems – Fundamentals of Economics: Consumer behavior, Supplier behavior, Market equilibrium, Short and long run costs, Various costs of production – Market models: Market models based on Contractual arrangements, Comparison of various market models, Electricity vis– a – vis other commodities, Market architecture, Case study.

UNITII TRANSMISSIONCONGESTIONMANAGEMENT 9

Introduction: Definition of Congestion, reasons for transfer capability limitation, Importance of congestion management, Features of congestion management – Classification of congestion management methods – Calculation of ATC - Non – market methods – Market methods – Nodal pricing – Inter zonal and Intra zonal congestion management – Price area congestion management – Capacity alleviation method.

UNIT III LOCATIONAL MARGINAL PRICES AND FINANCIAL TRANSMISSION RIGHTS 9

Mathematical preliminaries: - Locational marginal pricing– Lossless DCOPF model for LMP calculation – Loss compensated DCOPF model for LMP calculation – ACOPF model for LMP calculation – Financial Transmission rights – Risk hedging functionality -Simultaneous feasibility test and revenue adequency – FTR issuance process: FTR auction, FTR allocation – Treatment of revenue shortfall – Secondary trading of FTRs – Flow gate rights – FTR and market power - FTR and merchant transmission investment.

UNIT IV ANCILLARY SERVICE MANAGEMENT AND PRICING OF TRANSMISSION NETWORK 9

Introduction of ancillary services – Types of Ancillary services – Classification of Ancillary services – Load generation balancing related services –Voltagecontrol and reactive power support devices – Black start capability service - How to obtain ancillary service –Co-optimization of energy and reserve services - Transmission pricing – Principles – Classification – Rolled in transmission pricing methods –

Marginal transmission pricing paradigm – Composite pricing paradigm – Merits and demerits of different paradigm.

UNITV REFORMSININDIANPOWER SECTOR 9

Introduction – Framework of Indian power sector – Reform initiatives - Availability based tariff – Electricity act 2003 – Open access issues – Power exchange – Reforms in the near future

TOTAL:45PERIODS

OUTCOMES:

- Learnerswillhaveknowledgeonrestructuringofpowerindustry
- Learnerswillunderstandbasicsofcongestionmanagement
- Learners will attain knowledge about locational margin prices and financial transmission rights
- Learnerswillunderstandthesignificanceancillaryservicesandpricingof transmission network
- Learnerswillhaveknowledgeonthevariouspowersectorsin India

REFERENCES

1 Mohammad Shahidehpour, Muwaffaq Alomoush, Marcel Dekker, "Restructured electrical power systems: operation, trading and volatility" Pub., 2001.
2 Kankar Bhattacharya, Jaap E. Daadler, Math H.J. Boolen, "Operation of restructured power systems", Kluwer Academic Pub., 2001.
3 Paranjothi, S.R. , "Modern Power Systems" Paranjothi, S.R. , New Age International, 2017.
4 SallyHunt,"Makingcompetitionworkinelectricity",JohnWilleyandSons Inc.2002.
5 StevenStoft,"Powersystemeconomics:designingmarketsforelectricity", JohnWiley&Sons, 2002.

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Department of Artificial Intelligence and Data Science

BTech(2022-2023)

Mapping of Courses to Cross Cutting Issues

Programme Name & Course Code	Course Name	Profession alEthics	Gender Sensitization	Human Values	Environment and Sustainability
B.Tech-22147IP	Induction Programme	-	-	-	-
B.Tech-22147S11	Professional English - I	✓			
B.Tech-22148S12	Matrices and Calculus	-	-	-	-
B.Tech-22149S13	Engineering Physics	-	-	-	-
B.Tech-22149S14	Engineering Chemistry	-	-	-	-
B.Tech-22150S15	Problem Solving and Python Programming	-	-	-	-
B.Tech-22150L16	Problem Solving and Python Programming Laboratory	-	-	-	-
B.Tech-	Physics and Chemistry	-	-	-	-

22149L17	Laboratory				
B.Tech-22147L18	Communication Laboratory – I	-	-	-	-
B.Tech-22147S21	Professional English – II	✓			
B.Tech-22148S22	Statistics and Numerical Methods	-	-	-	-
B.Tech-22149S23A	Physics for Information Science	-	-	-	-
B.Tech-22154S24	Engineering Graphics	-	-	-	-
B.Tech-22153S25A	Basic Electrical and Electronics Engineering	-	-	-	-
B.Tech-221AIDS26	Data Structures Design	-	-	-	-
B.Tech-22154L27	Engineering Practices Laboratory	-	-	-	-
B.Tech-221AIDL28	Data Structures Design Laboratory	-	-	-	-
B.Tech-22147L29	Communication Laboratory – II	✓	-	-	-
B.Tech-22148S31A	Discrete Mathematics	-	-	-	-
B.Tech-221AIDS32	Digital Principles and Computer Organization	-	-	-	-
B.Tech-221AIDC33	Database Design and Management	-	-	-	-
B.Tech-221AIDC34	Design and Analysis of Algorithm	-	-	-	-
B.Tech-	Data Exploration and	-	-	-	-

221AIDC35	Visualization				
B.Tech-221AIDC36	Artificial Intelligence	-	-	-	-
B.Tech-221AIDL37	Database Design and Management Laboratory	-	-	-	-
B.Tech-221AIDL38	Artificial Intelligence Laboratory	-	-	-	-
B.Tech-221AIDL39	Professional Development	✓	-	-	-
B.Tech-22148S41A	Probability and Statistics	-	-	-	-
B.Tech-221AIDC42	Operating Systems	-	-	-	-
B.Tech-221AIDC43	Machine Learning	-	-	-	-
B.Tech-221AIDC44	Fundamentals of Data Science and Analysis	-	-	-	-
B.Tech-221AIDC45	Computer Networks	-	-	-	-
B.Tech-22149S46	Environmental Sciences and Sustainability	-	-	-	✓
B.Tech-221AIDL47	Data Science and Analysis Laboratory	-	-	-	-
B.Tech-221AIDL48	Machine Learning Laboratory	-	-	-	-
B.Tech-221AIDC51	Deep Learning	-	-	-	-
B.Tech-221AIDC52	Data and Information Security	-	-	-	-
B.Tech-	Distributed Computing	-	-	-	-

221AIDC53					
B.Tech-221AIDC54	Big Data Analytics	-	-	-	-
B.Tech-22152S61	Embedded Systems and IOT Design	-	-	-	-
B.Tech-22147S71	Human Values and Ethics	-	-	-	-
B.Tech-221AIDC81	Project Work/ Internship	-	-	-	-
B.Tech-221AIDC55A	Knowledge Engineering	-	-	-	-
B.Tech-221AIDC55B	Recommender Systems	-	-	-	-
B.Tech-221AIDC55C	Soft Computing	-	-	-	-
B.Tech-221AIDC55D	Text and Speech Analysis	-	-	-	-
B.Tech-221AIDC55E	Business Analytics	-	-	-	-
B.Tech-221AIDC55F	Image and video analytics	-	-	-	-
B.Tech-221AIDC55G	Computer Vision	-	-	-	-
B.Tech-221AIDC55H	Big Data Analytics	-	-	-	-
B.Tech-221AIDC56A	Cloud Computing	-	-	-	-
B.Tech-221AIDC56B	App Development	-	-	-	-
B.Tech-221AIDC56C	Cloud Services Management	-	-	-	-
B.Tech-	UI and UX Design	-	-	-	-

221AIDC56D					
B.Tech-221AIDC56E	Software Testing and Automation	-	-	-	-
B.Tech-221AIDC56F	Web Application Security	-	-	-	-
B.Tech-221AIDC56G	Dev-ops	-	-	-	-
B.Tech-221AIDC56H	Principles of Programming Languages	-	-	-	-
B.Tech-221AIDC63A	Cloud Computing	-	-	-	-
B.Tech-221AIDC63B	Virtualization	-	-	-	-
B.Tech-221AIDC63C	Cloud Services Management	-	-	-	-
B.Tech-221AIDC63D	Data Warehousing	-	-	-	-
B.Tech-221AIDC63E	Storage Technologies	-	-	-	-
B.Tech-221AIDC63F	Software Defined Networks	-	-	-	-
B.Tech-221AIDC63G	Stream Processing	-	-	-	-
B.Tech-221AIDC63H	Security and Privacy in Cloud	-	-	-	-
B.Tech-22AIDC64A	Ethical Hacking	-	-	-	-
B.Tech-22AIDC64B	Digital and Mobile Forensics works	-	-	-	-
B.Tech-22AIDC64C	Social Network Security	-	-	-	-
B.Tech-	Modern Cryptography	-	-	-	-

B.Tech-221AIDC66D	Cyber security	-	-	-	-
B.Tech-221AIDC66E	Quantum Computing	-	-	-	-
B.Tech-221AIDC66F	Cryptocurrency and Blockchain Technologies	-	-	-	-
B.Tech-221AIDC66G	Game Development	-	-	-	-
B.Tech-221AIDC66H	3D Printing and Design	-	-	-	-
B.Tech-22160E75A	Principles of Management	✓	-	-	-
B.Tech-22160E75B	Total Quality Management	✓	-	-	-
B.Tech-22160E75C	Industrial Management	-	-	-	-
B.Tech-22150FE67A	IoT Concepts and Applications (CSE)	-	-	-	-
B.Tech-22150FE75A	Data Science Fundamentals (CSE)	-	-	-	-
B.Tech-22150FE75B	Artificial Intelligence and Machine Learning Fundamentals	-	-	-	-
B.Tech-22147FE76A	English for Competitive	-	-	-	-
B.Tech-22153FE76A	Renewable Energy Technologies	-	-	-	-
B.Tech-22153FE76B	Electric and Hybrid Vehicle(EEE)	-	-	-	-
B.Tech-22152FE76A	Biomedical Instrumentation (ECE)	-	-	-	-

B.Tech-22152FE76B	Fundamentals of Electronic Device and Circuit	-	-	-	-
B.Tech-22154FE77A	Additive Manufacturing (MECHANICAL)	-	-	-	-
B.Tech-22154FE77B	InIndustrial safety (MECHANICAL)	-	-	-	-
B.Tech-22153FE77A	Sensors (EEE)	-	-	-	-
B.Tech-22152FE77A	Wearable devices (ECE)	-	-	-	-
B.Tech-22152FE77B	Medical Informatics (ECE)	-	-	-	-
B.Tech-22147MC57A	Introduction to Women and Gender Studies	-	-	-	-
B.Tech-22147MC57B	Elements of Literature	-	-	-	-
B.Tech-22147MC57C	Film Appreciation	-	-	-	-
B.Tech-22147MC57D	Disaster Management	✓	-	-	-
B.Tech-22147MC67A	Well Being with Traditional Practices(Yoga, Ayurveda and Siddha)	-	-	✓	-
B.Tech-22147MC67B	History of Science and Technology in India	-	-	-	-
B.Tech-22147MC67C	Political and Economic Thought for a Humane Society	-	-	-	-
B.Tech-22147MC67D	State, Nation Building and Politics in India	-	-	-	-

PRIST
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UNIVERSITY
NAAC ACCREDITED THANJAVUR – 613 403 - TAMIL NADU

SCHOOL OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF
ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

PROGRAM HANDBOOK

B.Tech – FULL TIME

[Regulation 2022]

Human Values
Professional Ethics
Environment and Sustainability
Gender Sensitization

B.TECH (FULL TIME) –AIDS – R-2021
I - VIII SEMESTERS CURRICULUM
SEMESTER I

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	22147IP	Induction Programme	-	-	-	0
2.	22147S11	Professional English - I	3	0	0	3
3.	22148S12	Matrices and Calculus	3	1	0	4
4.	22149S13	Engineering Physics	3	0	0	3
5.	22149S14	Engineering Chemistry	3	0	0	3
6.	22150S15	Problem Solving and Python Programming	3	0	0	3
		PRACTICALS				
7.	22150L16	Problem Solving and Python Programming Laboratory	0	0	4	2
8.	22149L17	Physics and Chemistry Laboratory	0	0	4	2
9.	22147L18	Communication Laboratory – I	0	0	2	1
		TOTAL	15	1	10	**21**

SEMESTER II

Sl. No.	COURSE CODE	COURSE TITLE	L	T	P	C
		THEORY				
1.	22147S21	Professional English – II	3	0	0	3
2.	22148S22	Statistics and Numerical Methods	3	1	0	4
3.	22149S23A	Physics for Information Science	3	0	0	3
4.	22154S24	Engineering Graphics	2	0	4	4
5.	22153S25A	Basic Electrical and Electronics Engineering				
6.	221AIDS26	Data Structures Design	3	0	0	3
		PRACTICALS				
7.	22154L27	Engineering Practices Laboratory	0	0	4	2
8.	221AIDL28	Data Structures Design Laboratory	0	0	4	2
9.	22147L29	Communication Laboratory – II	0	0	4	2
		TOTAL	17	2	16	**27**

SEMESTER III

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	22148S31A	Discrete Mathematics	3	1	0	4
2.	221AIDS32	Digital Principles and Computer Organization	3	0	0	3
3.	221AIDC33	Database Design and Management	3	0	0	3
4.	221AIDC34	Design and Analysis of Algorithm	3	0	2	4
5.	221AIDC35	Data Exploration and Visualization	3	0	0	3
6.	221AIDC36	Artificial Intelligence	3	0	0	3
PRACTICALS						
7.	221AIDL37	Database Design and Management Laboratory	0	0	4 4	2
8.	221AIDL38	Artificial Intelligence Laboratory	0	0	4	2
9.	221AIDL39	Professional Development	0	0	2	1
		TOTAL	18	1	12	25

SEMESTER IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	22148S41A	Probability and Statistics	3	1	0	4
2.	221AIDC42	Operating Systems	3	0	2	4
3.	221AIDC43	Machine Learning	3	0	0	3
4.	221AIDC44	Fundamentals of Data Science and Analysis	3	0	0	3
5.	221AIDC45	Computer Networks	3	0	2	4
6.	22149S46	Environmental Sciences and Sustainability	2	0	0	2
PRACTICALS						
7.	221AIDL47	Data Science and Analysis Laboratory	0	0	4	2
8.	221AIDL48	Machine Learning Laboratory	0	0	4	2
		TOTAL	17	0	12	24

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	221AIDC51	Deep Learning	3	0	0	3
2.	221AIDC52	Data and Information Security	3	0	0	3
3.	221AIDC53	Distributed Computing	3	0	0	3
4.	221AIDC54	Big Data Analytics	3	0	0	3
5.	221AIDC55_	Professional Elective I				
6.	221AIDC56_	Professional Elective II				
7.	22147MC57_	Mandatory Course - I	3	0	0	0
		TOTAL	21	0	4	**21**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	22152S61	Embedded Systems and IOT Design	3	0	2	4
2.	221_ _OE62_	Open Elective - I	3	0	0	3
3.	221AIDC63_	Professional Elective – III	3	0	0	3
4.	221AIDC64_	Professional Elective – IV	3	0	0	3
5.	221AIDC65_	Professional Elective – V				
6.	221AIDC66_	Professional Elective – VI	3	0	0	3
7.	**22147MC67_**	Mandatory Course - II	3	0	0	0
		TOTAL	21	0	4	**16**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
THEORY						
1.	22147S71	Human Values and Ethics	2	0	0	2
2.	221_ _OE73_	Open Elective – II	3	0	0	3
3.	221_ _OE74_	Open Elective – III	3	0	0	3
4.	221_ _OE75_	Open Elective – IV	3	0	0	3
5.	22160E75_	Elective Management	3	0	0	3
		TOTAL	14	0	0	14

SEMESTER VIII

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
PRACTICALS						
1.	221AIDC81	Project Work/ Internship	0	0	20	10
		TOTAL	0	0	20	**10**
		TOTAL NO. OF CREDITS:				**162**

LIST OF ELECTIVES

ELECTIVE - I (SEMESTER V)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	221AIDC55A	Knowledge Engineering	2	0	2	3
2.	221AIDC55B	RecommenderSystems	2	0	2	3
3.	221AIDC55C	Soft Computing	2	0	2	3
4.	221AIDC55D	Text and SpeechAnalysis	2	0	2	3
5.	221AIDC55E	Business Analytics	2	0	2	3
6.	221AIDC55F	Image and videoanalytics	2	0	2	3
7.	221AIDC55G	Computer Vision	2	0	2	3
8.	221AIDC55H	Big Data Analytics	2	0	2	3

ELECTIVE – II (SEMESTER V)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	221AIDC56A	Cloud Computing	2	0	2	3
2.	221AIDC56B	App Development	2	0	2	3
3.	221AIDC56C	Cloud Services Management	2	0	2	3
4.	221AIDC56D	UI and UX Design	2	0	2	3
5.	221AIDC56E	Software Testing and Automation	2	0	2	3
6.	221AIDC56F	Web Application Security	2	0	2	3
7.	221AIDC56G	Dev-ops	2	0	2	3
8.	221AIDC56H	Principles of ProgrammingLanguages	2	0	2	3

ELECTIVE – III (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	221AIDC63A	Cloud Computing	2	0	2	3
2.	221AIDC63B	Virtualization	2	0	2	3
3.	221AIDC63C	Cloud Services Management	2	0	2	3
4.	221AIDC63D	Data Warehousing	2	0	2	3
5.	221AIDC63E	Storage Technologies	2	0	2	3
6.	221AIDC63F	Software Defined Networks	2	0	2	3
7.	221AIDC63G	Stream Processing	2	0	2	3
8.	221AIDC63H	Security and Privacy in Cloud	2	0	2	3

ELECTIVE – IV (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22AIDC64A	Ethical Hacking	2	0	2	3
2.	22AIDC64B	Digital and MobileForensics works	2	0	2	3
3.	22AIDC64C	Social Network Security	2	0	2	3
4.	22AIDC64D	Modern Cryptography	2	0	2	3
5.	22AIDC64E	Engineering Secure Software Systems	2	0	2	3
6.	22AIDC64F	Cryptocurrency and Blockchain Technologies	2	0	2	3
7.	22AIDC64G	Network Security	2	0	2	3
8.	22AIDC64H	Security and Privacy in Cloud	2	0	2	3

ELECTIVE - V (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	221AIDC65A	Augmented Reality/Virtual Reality	2	0	2	3
2.	221AIDC65B	Multimedia and Animation	2	0	2	3
3.	221AIDC65C	Video Creation and Editing	2	0	2	3
4.	221AIDC65D	UI and UX Design	2	0	2	3
5.	221AIDC65E	Digital marketing	2	0	2	3
6.	221AIDC65F	Multimedia Data Compression and Storage	2	0	2	3
7.	221AIDC65G	Game Development	2	0	2	3
8.	221AIDC65H	Visual Effects	2	0	2	3

ELECTIVE - VI (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	221AIDC66A	Augmented Reality/Virtual Reality	2	0	2	3
2.	221AIDC66B	Robotic Process Automation	2	0	2	3
3.	221AIDC66C	Neural Networks and Deep Learning	2	0	2	3
4.	221AIDC66D	Cyber security	2	0	2	3
5.	221AIDC66E	Quantum Computing	2	0	2	3
6.	221AIDC66F	Cryptocurrency and Blockchain Technologies	2	0	2	3
7.	221AIDC66G	Game Development	2	0	2	3
8.	221AIDC66H	3D Printing and Design	2	0	2	3

ELECTIVE - VII (SEMESTER VII)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22160E75A	Principles of Management	3	0	0	3
2.	22160E75B	Total Quality Management	3	0	0	3
3.	22160E75C	Industrial Management	3	0	0	3

LIST OF OPEN ELECTIVES

SEMESTER VI
OPEN ELECTIVE-I

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	22150FE67A	IoT Concepts andApplications (CSE)	2	0	2	3
2	22150FE67B	Augmented and Virtual Reality (CSE)	2	0	2	3

SEMESTER VII
OPEN ELECTIVE-II

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	22150FE75A	Data Science Fundamentals (CSE)	2	0	2	3
2	22150FE75B	Artificial Intelligence andMachine Learning Fundamentals	2	0	2	3

OPEN ELECTIVE-III

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	22147FE76A	English for Competitive Examinations	3	0	0	3
2	22153FE76A	Renewable Energy Technologies(EEE)	3	0	0	3
3	22153FE76B	Electric and Hybrid Vehicle(EEE)	3	0	0	3
4	22154FE76A	Introduction to non-destructive testing (MECHANICAL)	3	0	0	3
5	22154FE76B	Industrial Management	3	0	0	3
6	22152FE76A	Biomedical Instrumentation (ECE)	3	0	0	3
7	22152FE76B	Fundamentals of Electronic Devices and Circuits(ECE)	3	0	0	3

OPEN ELECTIVE-IV

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1	22154FE77A	Additive Manufacturing (MECHANICAL)	3	0	0	3
2	22154FE77B	InIndustrial safety (MECHANICAL)	3	0	0	3
3	22153FE77A	Sensors (EEE)	3	0	0	3
4	22153FE77B	ElElectrical, Electronic and Magnetic materials (EEE)	3	0	0	3
5	22152FE77A	Wearable devices (ECE)	3	0	0	3
6	22152FE77B	Medical Informatics (ECE)	3	0	0	3

LIST OF MANDATORY COURSES

MANDATORY COURSE – I (SEMESTER V)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22147MC57A	Introduction to Women and Gender Studies	3	0	0	3
2.	22147MC57B	Elements of Literature	3	0	0	3
3.	22147MC57C	Film Appreciation	3	0	0	3
4.	22147MC57D	Disaster Management	3	0	0	3

MANDATORY COURSE – II (SEMESTER VI)

Sl. No	COURSE CODE	COURSE TITLE	L	T	P	C
1.	22147MC67A	Well Being with Traditional Practices (Yoga, Ayurveda and Siddha)	3	0	0	3
2.	22147MC67B	History of Science and Technology in India	3	0	0	3
3.	22147MC67C	Political and Economic Thought for a Humane Society	3	0	0	3
4.	22147MC67D	State, Nation Building and Politics in India	3	0	0	3

22147IP **INDUCTION PROGRAMME**

This is a mandatory 2 week programme to be conducted as soon as the students enter the institution. Normal classes start only after the induction program is over.

The induction programme has been introduced by AICTE with the following objective:

“Engineering colleges were established to train graduates well in the branch/department of admission, have a holistic outlook, and have a desire to work for national needs and beyond. The graduating student must have knowledge and skills in the area of his/her study. However, he/she must also have a broad understanding of society and relationships. Character needs to be nurturedas an essential quality by which he/she would understand and fulfill his/her responsibility as an engineer, a citizen and a human being. Besides the above, several meta-skills and underlying values are needed.”

“One will have to work closely with the newly joined students in making them feel comfortable, allow them to explore their academic interests and activities, reduce competition and make them work for excellence, promote bonding within them, build relations between teachers and students, give a broader view of life, and build character. “

Hence, the purpose of this programme is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, peoplearound them, society at large, and nature.

The following are the activities under the induction program in which the student would be fully engaged throughout the day for the entire duration of the program.

(i) Physical Activity

This would involve a daily routine of physical activity with games and sports, yoga, gardening, etc.

(ii) Creative Arts

Every student would choose one skill related to the arts whether visual arts or performing arts. Examples are painting, sculpture, pottery, music, dance etc. The student would pursue it everyday for the duration of the program. These would allow for creative expression. It would develop a sense of aesthetics and
also enhance creativity which would, hopefully, grow into engineering design later.

(iii) Universal Human Values

This is the anchoring activity of the Induction Programme. It gets the student to explore oneself and allows one to experience the joy of learning, stand up to peer pressure, make decisions with courage, be aware of relationships with colleagues and supporting stay in the hostel and department, be sensitive to others, etc. A module in Universal Human Values provides the base. Methodology of teaching this content is extremely important. It must not be through do's anddon'ts, but get students to explore and think by engaging them in a dialogue. It is best taught through group discussions and real life activities rather than lecturing.

Discussions would be conducted in small groups of about 20 students with a faculty mentor each. It would be effective that the faculty mentor assigned is also the faculty advisor for the student for the full duration of the UG programme.

(iv) Literary Activity

Literary activity would encompass reading, writing and possibly, debating, enacting a play etc.

(v) Proficiency Modules

This would address some lacunas that students might have, for example, English, computer familiarity etc.

(vi) Lectures by Eminent People

Motivational lectures by eminent people from all walks of life should be arranged to give the students exposure to people who are socially active or in public life.

(vii) Visits to Local Area

A couple of visits to the landmarks of the city, or a hospital or orphanage could be organized. This would familiarize them with the area as well as expose them to the underprivileged.

(viii) Familiarization to Dept./Branch & Innovations

They should be told about what getting into a branch or department means what role it plays in society, through its technology. They should also be shown the laboratories, workshops & other facilities.

(ix) Department Specific Activities

About a week can be spent in introducing activities (games, quizzes, social interactions, small experiments, design thinking etc.) that are relevant to the particular branch of Engineering / Technology / Architecture that can serve as a motivation and kindle interest in building things (become a maker) in that particular field. This can be conducted in the form of a workshop. For example, CSE and IT students may be introduced to activities that kindle computational thinking, and get them to build simple games. ECE students may be introduced to building simple circuits asan extension of their knowledge in Science, and so on. Students may be asked to build stuff using their knowledge of science.

Induction Programme is totally an activity based programme and therefore there shall be no tests / assessments during this programme.

References:

Guide to Induction program from AICTE

22147S11 PROFESSIONAL ENGLISH - I

L T P C 3 1 0 4

COURSE OBJECTIVES:

- To improve the communicative competence of learners
- To help learners use language effectively in academic /work contexts
- To build on students' English language skills by engaging them in listening, speaking andgrammar learning activities that are relevant to authentic contexts.
- To develop learners' ability to read and write complex texts, summaries, articles, blogs,definitions, essays and user manuals.
- To use language efficiently in expressing their opinions via various media.

INTRODUCTION TO EFFECTIVE COMMUNICATION 1

- What is effective communication? (There are many interesting activities for this.)
- Why is communication critical for excellence during study, research and work?
- What are the seven C's of effective communication?
- What are key language skills?
- What is effective listening? What does it involve?
- What is effective speaking?
- What does it mean to be an excellent reader? What should you be able to do?
- What is effective writing?
- How does one develop language and communication skills?
- What does the course focus on? How are communication and language skills going to be enhanced during this course? What do you as a learner need to do to enhance yourEnglish language and communication skills to get the best out of this course?

UNIT I INTRODUCTION TO FUNDAMENTALS OF COMMUNICATION 11

Listening –for general information-specific details- conversation: Introduction to classmates - Audio / video (formal & informal); Telephone conversation; Listening to voicemail & messages; Listening and filling a form

Speaking - Self Introduction; Introducing a friend; Conversation - politeness strategies; Telephone conversation; Leave a voicemail; Leave a message with another person; asking for information to fill details in a form.

Reading - Reading brochures (technical context), telephone messages / social media messages relevant to technical contexts and emails.

Writing - Writing emails / letters introducing oneself

Grammar - Present Tense (simple and progressive); Question types: Wh / Yes or No/ and Tags

Vocabulary - Synonyms; One word substitution; Abbreviations & Acronyms (as used in technicalcontexts).

UNIT II NARRATION AND SUMMATION 12

Listening - Listening to podcasts, anecdotes / stories / event narration; documentaries and interviews with celebrities.

Speaking - Narrating personal experiences / events; Interviewing a celebrity; Reporting / and summarizing documentaries / podcasts/ interviews.

Reading - Reading biographies, travelogues, newspaper reports, Excerpts from literature, an dtravel & technical blogs.

Writing - Guided writing-- Paragraph writing Short Report on an event (field trip etc.)Grammar –Past tense (simple); Subject-Verb Agreement; and Prepositions
Vocabulary - Word forms (prefixes & suffixes); Synonyms and Antonyms. Phrasal verbs.

UNIT III DESCRIPTION OF A PROCESS / PRODUCT 12

Listening - Listen to a product and process descriptions; a classroom lecture; and advertisements about products.
Speaking – Picture description; giving instruction to use the product; Presenting a product; and Summarizing a lecture.
Reading – Reading advertisements, gadget reviews; user manuals. Writing - Writing definitions; instructions; and Product /Process description.
Grammar - Imperatives; Adjectives; Degrees of comparison; Present & Past Perfect Tenses. Vocabulary - Compound Nouns, Homonyms; and Homophones, discourse markers (connectives & sequence words)

UNIT IV CLASSIFICATION AND RECOMMENDATIONS 12

Listening – Listening to TED Talks; Scientific lectures; and educational videos.Speaking – Small Talk; Mini presentations and making recommendations.
Reading – Newspaper articles; Journal reports –and Non Verbal Communication (tables, pie charts etc,)
Writing – Note-making / Note-taking (*Study skills to be taught, not tested; Writingrecommendations; Transferring information from non verbal (chart , graph etc, to verbal mode) Grammar – Articles; Pronouns - Possessive & Relative pronouns.
Vocabulary - Collocations; Fixed / Semi fixed expressions.

UNIT V EXPRESSION 12

Listening – Listening to debates/ discussions; different viewpoints on an issue; and panel discussions.
Speaking –group discussions, Debates, and Expressing opinions through Simulations & Role play.
Reading – Reading editorials; and Opinion Blogs;
Writing – Essay Writing (Descriptive or narrative).
Grammar – Future Tenses, Punctuation; Negation (Statements & Questions); and Simple, Compound & Complex Sentences.
Vocabulary - Cause & Effect Expressions – Content vs Function words.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

- To listen and comprehend complex academic texts
- To read and infer the denotative and connotative meanings of technical texts
- To write definitions, descriptions, narrations and essays on various topics
- To speak fluently and accurately in formal and informal communicative contexts
- To express their opinions effectively in both oral and written medium of communication

TEXT BOOKS:

1. English for Engineers & Technologists Orient Blackswan Private Ltd. Department

ofEnglish, Anna University, (2020 edition)
2. English for Science & Technology Cambridge University Press, 2021.
3. Authored by Dr. Veena Selvam, Dr. Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN.Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Technical Communication – Principles And Practices By Meenakshi Raman & SangeetaSharma, Oxford Univ. Press, 2016, New Delhi.
2. A Course Book on Technical English By Lakshmi Narayanan, Scitech Publications (India)Pvt. Ltd.
3. English For Technical Communication (With CD) By Aysha Viswamohan, Mcgraw HillEducation, ISBN : 0070264244.
4. Effective Communication Skill, Kulbhusan Kumar, R S Salaria, Khanna Publishing House.
5. Learning to Communicate – Dr. V. Chellammal, Allied Publishing House, New Delhi,2003.

148S M **MATRICES AND CALCULUS** **L T P C**

3 1 0 4

COURSE OBJECTIVES:

- To develop the use of matrix algebra techniques that are needed by engineers for practicalapplications.
- To familiarize the students with differential calculus.
- To familiarize the student with functions of several variables. This is needed in manybranches of engineering.
- To make the students understand various techniques of integration.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals andtheir applications.

UNIT I MATRICES 9 + 3

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

UNIT II DIFFERENTIAL CALCULUS 9 + 3

Representation of functions - Limit of a function - Continuity - Derivatives - Differentiation rules (sum, product, quotient, chain rules) - Implicit differentiation - Logarithmic differentiation - Applications : Maxima and Minima of functions of one variable.

UNIT III FUNCTIONS OF SEVERAL VARIABLES 9 + 3

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 – Applications : Maxima and minima of functions of two variables and Lagrange's method of undetermined multipliers.

UNIT IV INTEGRAL CALCULUS 9 + 3

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 - Applications : Hydrostatic force and pressure, moments and centres of mass.

UNIT V MULTIPLE INTEGRALS 9 + 3

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 – Applications : Moments and centres of mass, moment of inertia.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Use the matrix algebra methods for solving practical problems.
- Apply differential calculus tools in solving various application problems.
- Able to use differential calculus ideas on several variable functions.
- Apply different methods of integration in solving practical problems.
- Apply multiple integral ideas in solving areas, volumes and other practical problems.

TEX BOOKS:
T

1. Kreyszig.E, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
2. Grewal.B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition , 2018.
3. James Stewart, " Calculus : Early Transcendentals ", Cengage Learning, 8th Edition, New Delhi, 2015. [For Units II & IV - 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 changetheorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:

1. Anton. H, Bivens. I and Davis. S, " Calculus ", Wiley, 10th Edition, 2016
2. Bali. N., Goyal. M. and Watkins. C., “ Advanced Engineering Mathematics ”, FirewallMedia (An imprint of Lakshmi Publications Pvt., Ltd.,), New Delhi, 7th Edition, 2009.
3. Jain . R.K. and Iyengar. S.R.K., “ Advanced Engineering Mathematics ”, NarosaPublications, New Delhi, 5th Edition, 2016.
4. Narayanan. S. and Manicavachagom Pillai. T. K., “Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2009.
5. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd,New Delhi, 2016.
6. Srimantha Pal and Bhunia. S.C, "Engineering Mathematics" Oxford University Press,2015.
7. Thomas. G. B., Hass. J, and Weir. M.D, " Thomas Calculus ", 14th Edition,

Pearson India,2018.

22149S13 ENGINEERING PHYSICS

L T P C3 0 0 3

COURSE OBJECTIVES:

- To make the students effectively achieve an understanding of mechanics.
- To enable the students to gain knowledge of electromagnetic waves and its applications.
- To introduce the basics of oscillations, optics and lasers.
- Equipping the students to successfully understand the importance of quantum physics.
- To motivate the students towards the applications of quantum mechanics.

UNIT I MECHANICS 9

Multi-particle dynamics: Center of mass (CM) – CM of continuous bodies – motion of the CM – kinetic energy of the system of particles. Rotation of rigid bodies: Rotational kinematics – rotational kinetic energy and moment of inertia - theorems of M .I –moment of inertia of continuous bodies – of a diatomic molecule - torque – rotational dynamics of rigid bodies – conservation of angular momentum – rotational energy state of a rigid diatomic molecule - gyroscope - torsional pendulum – double pendulum –Introduction to nonlinear oscillations.

UNIT II ELECTROMAGNETIC WAVES 9

The Maxwell's equations - wave equation; Plane electromagnetic waves in vacuum, Conditions on the wave field - properties of electromagnetic waves: speed, amplitude, phase, orientation and waves in matter - polarization - Producing electromagnetic waves - Energy and momentum in EM waves: Intensity, waves from localized sources, momentum and radiation pressure - Cell-phone reception. Reflection and transmission of electromagnetic waves from a non-conducting medium- vacuum interface for normal incidence.

UNIT III OSCILLATIONS, OPTICS AND LASERS 9

Simple harmonic motion - resonance –analogy between electrical and mechanical oscillatingsystems - waves on a string - standing waves - traveling waves - Energy transfer of a wave - soundwaves - Doppler effect. Reflection and refraction of light waves - total internal reflection - interference – Michelson interferometer –Theory of air wedge and experiment. Theory of laser - characteristics - Spontaneous and stimulated emission - Einstein's coefficients - population inversion - Nd-YAG laser, CO2 laser, semiconductor laser –Basic applications of lasers in industry.

UNIT IV BASIC QUANTUM MECHANICS 9

Photons and light waves - Electrons and matter waves –Compton effect - The Schrodinger equation (Time dependent and time independent forms) - meaning of wave function - Normalization –Free particle - particle in a infinite potential well: 1D,2D and 3D Boxes- Normalization, probabilities and the correspondence principle.

UNIT V APPLIED QUANTUM MECHANICS 9

The harmonic oscillator(qualitative)- Barrier penetration and quantum tunneling(qualitative)- Tunneling microscope - Resonant diode - Finite potential wells (qualitative)- Bloch's theorem for particles in a periodic potential –Basics of Kronig-Penney model and origin of energy bands.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

After completion of this course, the students should be able to

- Understand the importance of mechanics.
- Express their knowledge in electromagnetic waves.
- Demonstrate a strong foundational knowledge in oscillations, optics and lasers.
- Understand the importance of quantum physics.
- Comprehend and apply quantum mechanical principles towards the formation of energybands.

TEXT BOOKS:

1. D.Kleppner and R.Kolenkow. An Introduction to Mechanics. McGraw Hill Education (IndianEdition), 2017.
2. E.M.Purcell and D.J.Morin, Electricity and Magnetism, Cambridge Univ.Press, 2013.
3. Arthur Beiser, Shobhit Mahajan, S. Rai Choudhury, Concepts of Modern Physics, McGraw-Hill (Indian Edition), 2017.

REFERENCES:

1. R.Wolfson. Essential University Physics. Volume 1 & 2. Pearson Education (Indian Edition),2009.
2. Paul A. Tipler, Physic – Volume 1 & 2, CBS, (Indian Edition), 2004.
3. K.Thyagarajan and A.Ghatak. Lasers: Fundamentals and Applications, Laxmi Publications,(Indian Edition), 2019.
4. D.Halliday, R.Resnick and J.Walker. Principles of Physics, Wiley (Indian Edition), 2015.
5. N.Garcia, A.Damask and S.Schwarz. Physics for Computer Science Students. Springer-Verlag, 2012.

22149S14 ENGINEERING CHEMISTRY L T P C

3 0 0 3

COURSE OBJECTIVES:

- To inculcate sound understanding of water quality parameters and water treatmenttechniques.
- To impart knowledge on the basic principles and preparatory methods of nanomaterials.
- To introduce the basic concepts and applications of phase rule and composites.
- To facilitate the understanding of different types of fuels, their preparation, properties andcombustion characteristics.
- To familiarize the students with the operating principles, working processes andapplications of energy conversion and storage devices.

UNIT I WATER AND ITS TREATMENT 9

Water: Sources and impurities, Water quality parameters: Definition and significance of-color, odour, turbidity, pH, hardness, alkalinity, TDS, COD and BOD, fluoride and arsenic. Municipal water treatment: primary treatment and disinfection (UV, Ozonation, break-point chlorination). Desalination of brackish water: Reverse Osmosis. Boiler troubles: Scale and sludge, Boiler corrosion, Caustic embrittlement, Priming & foaming. Treatment of boiler feed water: Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) and External treatment – Ion exchange demineralization and zeolite process.

UNIT II NANOCHEMISTRY 9

Basics: Distinction between molecules, nanomaterials and bulk materials; Size-dependent properties (optical, electrical, mechanical and magnetic); Types of nanomaterials: Definition, properties and uses of – nanoparticle, nanocluster, nanorod, nanowire and nanotube. Preparation of nanomaterials: sol-gel, solvothermal, laser ablation, chemical vapour deposition, electrochemical deposition and electro spinning. Applications of nanomaterials in medicine, agriculture, energy, electronics and catalysis.

UNIT III PHASE RULE AND COMPOSITES 9

Phase rule: Introduction, definition of terms with examples. One component system - water system; Reduced phase rule; Construction of a simple eutectic phase diagram - Thermal analysis; Two component system: lead-silver system - Pattinson process.

Composites: Introduction: Definition & Need for composites; Constitution: Matrix materials (Polymer matrix, metal matrix and ceramic matrix) and Reinforcement (fiber, particulates, flakes and whiskers). Properties and applications of: Metal matrix composites (MMC), Ceramic matrix composites and Polymer matrix composites. Hybrid composites - definition and examples.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction: Classification of fuels; Coal and coke: Analysis of coal (proximate and ultimate), Carbonization, Manufacture of metallurgical coke (Otto Hoffmann method). Petroleum and Diesel: Manufacture of synthetic petrol (Bergius process), Knocking - octane number, diesel oil - cetane number; 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. CO_2 emission and carbon footprint.

UNIT V ENERGY SOURCES AND STORAGE DEVICES

9

Stability of nucleus: mass defect (problems), binding energy; Nuclear energy: light water nuclear power plant, breeder reactor. Solar energy conversion: Principle, working and applications of solar cells; Recent developments in solar cell materials. Wind energy; Geothermal energy; Batteries: Types of batteries, Primary battery - dry cell, Secondary battery - lead acid battery and lithium-ion- battery; Electric vehicles - working principles; Fuel cells: H_2-O_2 fuel cell, microbial fuel cell; Supercapacitors: Storage principle, types and examples.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- To infer the quality of water from quality parameter data and propose suitable treatmentmethodologies to treat water.
- To identify and apply basic concepts of nanoscience and nanotechnology in designingthe synthesis of nanomaterials for engineering and technology applications.
- To apply the knowledge of phase rule and composites for material

selectionrequirements.

- To recommend suitable fuels for engineering processes and applications.
- To recognize different forms of energy resources and apply them for suitableapplications in energy sectors.

TEXT BOOKS:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", 17th Edition, Dhanpat Rai PublishingCompany (P) Ltd, New Delhi, 2018.
2. Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company Ltd, NewDelhi, 2008.
3. S.S. Dara, "A Text book of Engineering Chemistry", S. Chand Publishing, 12th Edition,2018

REFERENCES:

1. B. S. Murty, P. Shankar, Baldev Raj, B. B. Rath and James Murday, "Text book of nanoscience and nanotechnology", Universities Press-IIM Series in Metallurgy and Materials Science, 2018.
2. O.G. Palanna, "Engineering Chemistry" McGraw Hill Education (India) Private Limited, 2nd Edition, 2017.
3. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
4. ShikhaAgarwal, "Engineering Chemistry-Fundamentals and Applications", CambridgeUniversity Press, Delhi, Second Edition, 2019.
5. O.V. Roussak and H.D. Gesser, Applied Chemistry-A Text Book for Engineers andTechnologists, Springer Science Business Media, New York, 2nd Edition, 2013.

22150S15	Problem Solving and Python Programming	L T P C
		3 0 0 3

COURSE OBJECTIVES:

- To understand the basics of algorithmic problem solving.
- To learn to solve problems using Python conditionals and loops.
- To define Python functions and use function calls to solve problems.
- To use Python data structures - lists, tuples, dictionaries to represent complex data.
- To do input/output with files in Python.

UNIT I COMPUTATIONAL THINKING AND PROBLEM SOLVING 9

Fundamentals of Computing – Identification of Computational Problems -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 TYPES, EXPRESSIONS, STATEMENTS 9

Python interpreter and interactive mode,debugging; values and types: int, float, boolean, string

, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.

UNIT III CONTROL FLOW, FUNCTIONS, STRINGS 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: simple sorting, histogram, Students marks statement, Retail bill preparation.

UNIT V FILES, MODULES, PACKAGES 9

Files and exceptions: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file, Voter's age validation, Marks range validation (0-100).

TOTAL : 45 PERIODSCOURSE OUTCOMES:

Upon completion of the course, students will be able to

CO1: Develop algorithmic solutions to simple computational problems.
CO2: Develop and execute simple Python programs.
CO3: Write simple Python programs using conditionals and loops for solving problems.CO4: Decompose a Python program into functions.
CO5: Represent compound data using Python lists, tuples, dictionaries etc.CO6: 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,O'Reilly Publishers, 2016.

2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving andProgramming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition,2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmersand Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: WithApplications to Computational Modeling and Understanding Data‘‘, Third Edition, MIT Press , 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction toProgramming", 2nd Edition, No Starch Press, 2019.

5. https://www.python.org/
6. Martin C. Brown, “Python: The Complete Reference”, 4th Edition, Mc-Graw Hill, 2018.

22150L16 PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY

L T P C
0 0 4 2

COURSE OBJECTIVES:

- To understand the problem solving approaches.
- To learn the basic programming constructs in Python.
- To practice various computing strategies for Python-based solutions to real world problems.
- To use Python data structures - lists, tuples, dictionaries.
- To do input/output with files in Python.

EXPERIMENTS:

Note: The examples suggested in each experiment are only indicative. The lab instructor is expected to design other problems on similar lines. The Examination shall not be restricted to the sample experiments listed here.

1.Identification and solving of simple real life or scientific or technical problems, and developingflow charts for the same. (Electricity Billing, Retail shop billing, Sin series, weight of a motorbike, Weight of a steel

bar, compute Electrical Current in Three Phase AC Circuit,

1. etc.)
2. Python programming using simple statements and expressions (exchange the values of two variables, circulate the values of n variables, distance between two points).
3. Scientific problems using Conditionals and Iterative loops. (Number series, Number Patterns,pyramid pattern)
4. Implementing real-time/technical applications using Lists, Tuples. (Items present in a library/Components of a car/ Materials required for construction of a building –operations of list & tuples)
5. Implementing real-time/technical applications using Sets, Dictionaries. (Language, components of an automobile, Elements of a civil structure, etc.- operations of Sets & Dictionaries)
6. Implementing programs using Functions. (Factorial, largest number in a list, area of shape)
7. Implementing programs using Strings. (reverse, palindrome, character count, replacingcharacters)
8. Implementing programs using written modules and Python Standard Libraries (pandas,numpy. Matplotlib, scipy)
9. Implementing real-time/technical applications using File handling. (copy from one file toanother, word count, longest word)
10. Implementing real-time/technical applications using Exception handling. (divide by zero error,voter’s age validity, student mark range validation)
11. Exploring Pygame tool.
12. Developing a game activity using Pygame like bouncing ball, car race etc.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

CO1: Develop algorithmic solutions to simple computational problems

CO2: Develop and execute simple Python programs.

CO3: Implement programs in Python using conditionals and loops for solving problems..

CO4: Deploy functions to decompose a Python program.

CO5: Process compound data using Python data structures.

CO6: Utilize Python packages in developing software applications.

TEXT BOOKS:

1. Allen B. Downey, "Think Python: How to Think like a Computer Scientist", 2nd Edition, O'Reilly Publishers, 2016.
2. Karl Beecher, "Computational Thinking: A Beginner's Guide to Problem Solving and Programming", 1st Edition, BCS Learning & Development Limited, 2017.

REFERENCES:

1. Paul Deitel and Harvey Deitel, "Python for Programmers", Pearson Education, 1st Edition, 2021.
2. G Venkatesh and Madhavan Mukund, "Computational Thinking: A Primer for Programmers and Data Scientists", 1st Edition, Notion Press, 2021.
3. John V Guttag, "Introduction to Computation and Programming Using Python: With Applications to Computational Modeling and Understanding Data", Third Edition, MIT Press, 2021
4. Eric Matthes, "Python Crash Course, A Hands - on Project Based Introduction to Programming", 2nd Edition, No Starch Press, 2019.
5. https://www.python.org/
6. Martin C. Brown, "Python: The Complete Reference", 4th Edition, Mc-Graw Hill, 2018.

22149L17	PHYSICS AND CHEMISTRY LABORATORY	L T P C
		0 0 4 2

<u>PHYSICS LABORATORY : (Any Seven Experiments)</u>

COURSE OBJECTIVES:

- To learn the proper use of various kinds of physics laboratory equipment.
- To learn how data can be collected, presented and interpreted in a clear and concisemanner.
- To learn problem solving skills related to physics principles and interpretation ofexperimental data.
- To determine error in experimental measurements and techniques used to minimize sucherror.
- To make the student an active participant in each part of all lab exercises.

1. Torsional pendulum - Determination of rigidity modulus of wire and

moment of inertiaof regular and irregular objects.
2. Simple harmonic oscillations of cantilever.
3. Non-uniform bending - Determination of Young’s modulus
4. Uniform bending – Determination of Young’s modulus
5. Laser- Determination of the wavelength of the laser using grating
6. Air wedge - Determination of thickness of a thin sheet/wire
7. a) Optical fibre -Determination of Numerical Aperture and acceptance angle
b) Compact disc- Determination of width of the groove using laser.
8. Acoustic grating- Determination of velocity of ultrasonic waves in liquids.
9. Ultrasonic interferometer – determination of the velocity of sound and compressibilityof liquids
10. Post office box -Determination of Band gap of a semiconductor.
11. Photoelectric effect
12. Michelson Interferometer.
13. Melde’s string experiment
14. Experiment with lattice dynamics kit.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

- Understand the functioning of various physics laboratory equipment.
- Use graphical models to analyze laboratory data.
- Use mathematical models as a medium for quantitative reasoning and describing physicalreality.
- Access, process and analyze scientific information.
- Solve problems individually and collaboratively.

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

- To inculcate experimental skills to test basic understanding of water quality parameters,such as, acidity, alkalinity, hardness, DO, chloride and copper.
- To induce the students to familiarize with electroanalytical techniques such as, pH metry,potentiometry and conductometry in the determination of impurities in aqueous solutions.
- To demonstrate the analysis of metals and alloys.
- To demonstrate the synthesis of nanoparticles

1. Preparation of Na2CO3 as a primary standard and estimation of acidity of a watersample using the primary standard
2. Determination of types and amount of alkalinity in a water sample.
- Split the first experiment into two
3. Determination of total, temporary & permanent hardness of water by EDTA method.
4. Determination of DO content of water sample by Winkler’s method.
5. Determination of chloride content of water sample by Argentometric method.
6. Estimation of copper content of the given solution by Iodometry.
7. Estimation of TDS of a water sample by gravimetry.
8. Determination of strength of given hydrochloric acid using pH meter.

9. Determination of strength of acids in a mixture of acids using conductivity meter.
10. Conductometric titration of barium chloride against sodium sulphate (precipitationtitration)
11. Estimation of iron content of the given solution using potentiometer.
12. Estimation of sodium /potassium present in water using a flame photometer.
13. Preparation of nanoparticles (TiO2/ZnO/CuO) by Sol-Gel method.
14. Estimation of Nickel in steel
15. Proximate analysis of Coal

TOTAL : 30 PERIODS

COURSE OUTCOMES :

- To analyse the quality of water samples with respect to their acidity, alkalinity, hardnessand DO.
- To determine the amount of metal ions through volumetric and spectroscopic techniques
- To analyse and determine the composition of alloys.
- To learn simple method of synthesis of nanoparticles
- To quantitatively analyse the impurities in solution by electroanalytical techniques

TEXT BOOKS :

1. J. Mendham, R. C. Denney, J.D. Barnes, M. Thomas and B. Sivasankar, Vogel's Textbookof Quantitative Chemical Analysis (2009

22147S21 PROFESSIONAL ENGLISH - II

L T P C

3 1 0 4

COURSE OBJECTIVES:

- To engage learners in meaningful language activities to improve their LSRW skills
- To enhance learners' awareness of general rules of writing for specific audiences
- To help learners understand the purpose, audience, contexts of different types of writing
- To develop analytical thinking skills for problem solving in communicative contexts
- To demonstrate an understanding of job applications and interviews for internship andplacements

UNIT I MAKING COMPARISONS 12

Listening – Evaluative Listening: Advertisements, Product Descriptions, -Audio / video; Listeningand filling a Graphic Organiser (Choosing a product or service by comparison)
Speaking – Marketing a product, Persuasive Speech Techniques.
Reading - Reading advertisements, user manuals, brochures;
Writing – Professional emails, Email etiquette - Compare and Contrast Essay; Grammar – Mixed Tenses, Prepositional phrases
Vocabulary – Contextual meaning of words

UNIT II EXPRESSING CAUSAL RELATIONS IN SPEAKING AND WRITING 12

Listening - Listening to longer technical talks and completing– gap filling exercises. Listening technical information from podcasts – Listening to process/event descriptions to identify cause & effects - Speaking – Describing and discussing the reasons of accidents or disasters based on news

reports.
Reading - Reading longer technical texts– Cause and Effect Essays, and Letters / emails of complaint, Writing - Writing responses to complaints.
Grammar - Active Passive Voice transformations, Infinitive and Gerunds Vocabulary – Word Formation (Noun-Verb-Adj-Adv), Adverbs.

UNIT III PROBLEM SOLVING 12

Listening – Listening to / Watching movie scenes/ documentaries depicting a technical problem and suggesting solutions.
Speaking – Group Discussion(based on case studies), - techniques and Strategies,
Reading - Case Studies, excerpts from literary texts, news reports etc.,
Writing – Letter to the Editor, Checklists, Problem solution essay / Argumentative EssayGrammar – Error correction; If conditional sentences
Vocabulary - Compound Words, Sentence Completion.

UNIT IV REPORTING OF EVENTS AND RESEARCH 12

Listening – Listening Comprehension based on news reports – and documentaries – Precis writing, Summarising, Speaking –Interviewing, Presenting an oral report, Mini presentations on select topics; Reading –Newspaper articles; Writing – Recommendations, Transcoding, Accident Report, Survey Report Grammar – Reported Speech, Modals Vocabulary – Conjunctions- use of prepositions

UNIT V THE ABILITY TO PUT IDEAS OR INFORMATION COGENTLY 12

Listening – Listening to TED Talks, Presentations, Formal job interviews, (analysis of the interview performance);
Speaking – Participating in a Role play, (interview/telephone interview), virtual interviews, Making presentations with visual aids;
Reading – Company profiles, Statement of Purpose, (SOP), an excerpt of interview with professionals; Writing – Job / Internship application – Cover letter & Resume; Grammar – Numerical adjectives, Relative Clauses Vocabulary – Idioms.

TOTAL : 60 PERIODS

COURSE OUTCOMES:

At the end of the course, learners will be able

- To compare and contrast products and ideas in technical texts.
- To identify cause and effects in events, industrial processes through technical texts
- To analyze problems in order to arrive at feasible solutions and communicate them orallyand in the written format.
- To report events and the processes of technical and industrial nature.
- To present their opinions in a planned and logical manner, and draft effective resumes incontext of job search.

TEXT BOOKS:

1. English for Engineers & Technologists (2020 edition) Orient Blackswan Private Ltd. Department of English, Anna University.
2. English for Science & Technology Cambridge University Press 2021.Dr. Veena Selvam, Dr.Sujatha Priyadarshini, Dr. Deepa Mary Francis, Dr. KN. Shoba, and Dr. Lourdes Joevani, Department of English, Anna University.

REFERENCES:

1. Raman. Meenakshi, Sharma. Sangeeta (2019). Professional English. Oxford universitypress. New Delhi.
2. Improve Your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, NewDelhi.
3. Learning to Communicate – Dr. V. Chellammal. Allied Publishers, New Delhi, 2003
4. Business Correspondence and Report Writing by Prof. R.C. Sharma & Krishna Mohan,Tata McGraw Hill & Co. Ltd., 2001, New Delhi.
5. Krishna Mohan, Meera Banerji, "Developing Communication Skills", Trinity Press, 2017.

22148S22 STATISTICS AND NUMERICAL METHODS L T P C 3 1 0 4

COURSE OBJECTIVES:

- This course aims at providing the necessary basic concepts of a few statistical and numerical methods and give procedures for solving numerically different kinds of problems occurring in engineering and technology.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of solving algebraic and transcendental equations.
- To introduce the numerical techniques of interpolation in various intervals and numerical techniques of differentiation and integration which plays an important role in engineering and technology disciplines.
- To acquaint the knowledge of various techniques and methods of solving ordinary differential equations.

UNIT I TESTING OF HYPOTHESIS 9 + 3

Sampling distributions - Tests for single mean, proportion and difference of means (Large and small samples) – Tests for single variance and equality of variances – Chi square test for goodness of fit – Independence of attributes.

UNIT II DESIGN OF EXPERIMENTS 9 + 3

One way and two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT III SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 9 + 3

Solution of algebraic and transcendental equations - Fixed point iteration method – Newton Raphson method- Solution of linear system of equations - Gauss elimination method – Pivoting - Gauss Jordan method – Iterative methods of Gauss Jacobi and Gauss Seidel - Eigenvalues of a matrix by Power method and Jacobi's method for symmetric matrices.

UNIT IV INTERPOLATION, NUMERICAL DIFFERENTIATION AND NUMERICAL INTEGRATION 9 +3

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 9 +3

Single step methods: Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first order differential equations - Multi step methods: Milne's and Adams - Bash forth predictor corrector methods for solving first order differential equations.

TOTAL: 60 PERIODS

COURSE 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 ofagriculture.
- Appreciate the numerical techniques of interpolation in various intervals and apply thenumerical techniques of differentiation and integration for engineering problems.
- Understandthe knowledge of various techniques and methods for solving first and secondorder ordinary differential equations.
- Solve the partial and ordinary differential equations with initial and boundary conditions byusing certain techniques with engineering applications.

TEXT BOOKS:

1. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", KhannaPublishers, 10th Edition, New Delhi, 2015.
2. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics forEngineers", 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", CengageLearning, New Delhi, 8th Edition, 2014.
3. Gerald. C.F. and Wheatley. P.O. "Applied Numerical Analysis" Pearson Education, Asia,New Delhi, 7th Edition, 2007.
4. Gupta S.C. and Kapoor V. K., "Fundamentals of Mathematical Statistics", Sultan Chand &Sons, New Delhi, 12th Edition, 2020.
5. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outlines on Probability andStatistics ", Tata McGraw Hill Edition, 4th Edition, 2012.
6. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineersand Scientists", 9th Edition, Pearson Education, Asia, 2010.

22149S23A PHYSICS FOR INFORMATION SCIENCE L T P C P

3 0 0 3

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COURSE OBJECTIVES:

- To make the students understand the importance in studying electrical properties ofmaterials.
- To enable the students to gain knowledge in semiconductor physics
- To instill knowledge on magnetic properties of materials.
- To establish a sound grasp of knowledge on different optical properties of materials, optical displays and applications
- To inculcate an idea of significance of nano structures, quantum confinement, ensuing nano device applications and quantum computing.

UNIT I ELECTRICAL PROPERTIES OF MATERIALS

information processing - quantum states – classical bits – quantum bits or qubits –CNOT gate - multiple qubits – Bloch sphere – quantum gates – advantage of quantum computing over classical computing.

TOTAL :45 PERIODS

COURSE OUTCOMES:

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

- gain knowledge on classical and quantum electron theories, and energy band structures
- acquire knowledge on basics of semiconductor physics and its applications in variousdevices
- 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 and basics of quantum computing

TEXT BOOKS:

1. Jasprit Singh, “Semiconductor Devices: Basic Principles”, Wiley (Indian Edition), 2007.
2. S.O. Kasap. Principles of Electronic Materials and Devices, McGraw-Hill Education (Indian Edition), 2020.
3. Parag K. Lala, Quantum Computing: A Beginner's Introduction, McGraw-Hill Education (Indian Edition), 2020.

REFERENCES:

1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition, 2019.
2. Y.B.Band and Y.Avishai, Quantum Mechanics with Applications to Nanotechnology and Information Science, Academic Press, 2013.
3. V.V.Mitin, V.A. Kochelap and M.A.Stroscio, Introduction to Nanoelectronics, Cambridge Univ.Press, 2008.
4. G.W. Hanson, Fundamentals of Nanoelectronics, Pearson Education (Indian Edition) 2009.
5. B.Rogers, J.Adams and S.Pennathur, Nanotechnology: Understanding Small Systems,CRC Press, 2014.

22153S25A BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C 3 0 0 3

CO URSE OBJECTIVES:

- To introduce the basics of electric circuits and analysis
- To impart knowledge in the basics of working principles and application of electrical machines
- To introduce analog devices and their characteristics
- To educate on the fundamental concepts of digital electronics
- To introduce the functional elements and working of measuring instruments

UNIT I ELECTRICAL CIRCUITS 9

DC Circuits: Circuit Components: Conductor, Resistor, Inductor, Capacitor – Ohm’s Law - Kirchhoff’s Laws –Independent and Dependent Sources – Simple problems- Nodal Analysis, Mesh analysis with Independent sources only (Steady state)

Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Instantaneous power, real power, reactive power and apparent power, power factor – Steady state
Classical free electron theory - Expression for electrical conductivity – Thermal conductivity, expression - Wiedemann-Franz law – Success and failures - electrons in metals – Particle in a three dimensional box – degenerate states – Fermi- Dirac statistics – Density of energy states – Electron in periodic potential – Energy bands in solids – tight binding approximation - Electron effective mass – concept of hole.

UNIT II SEMICONDUCTOR PHYSICS 9

Intrinsic Semiconductors – Energy band diagram – direct and indirect band gap semiconductors –Carrier concentration in intrinsic semiconductors – extrinsic semiconductors - Carrier concentration in N-type & P-type semiconductors – Variation of carrier concentration with temperature – variation of Fermi level with temperature and impurity concentration – Carriertransport in Semiconductor: random motion, drift, mobility and diffusion – Hall effect and devices – Ohmic contacts – Schottky diode.

UNIT III MAGNETIC PROPERTIES OF MATERIALS 9

Magnetic dipole moment – atomic magnetic moments- magnetic permeability and susceptibility - Magnetic material classification: diamagnetism – paramagnetism – ferromagnetism – antiferromagnetism – ferrimagnetism – Ferromagnetism: origin and exchange interaction- saturation magnetization and Curie temperature – Domain Theory- M versus H behaviour – Hard and soft magnetic materials – examples and uses-– Magnetic principle in computer data storage –Magnetic hard disc (GMR sensor).

UNIT IV OPTICAL PROPERTIES OF MATERIALS 9

Classification of optical materials – carrier generation and recombination processes - Absorption emission and scattering of light in metals, insulators and semiconductors (concepts only) - photo current in a P-N diode – solar cell - LED – Organic LED – Laser diodes – Optical data storage techniques.

UNIT V NANODEVICES AND QUANTUM COMPUTING 9

Introduction - quantum confinement – quantum structures: quantum wells, wires and dots –– bandgap of nanomaterials. Tunneling – Single electron phenomena: Coulomb blockade - resonant- tunneling diode – single electron transistor – quantum cellular automata - Quantum system for

analysis of RLC circuits (Simple problems only)

UNIT II ELECTRICAL MACHINES 9

Construction and Working principle- DC Separately and Self excited Generators, EMF equation, Types and Applications. Working Principle of DC motors, Torque Equation, Types and Applications. Construction, Working principle and Applications of Transformer, Three phase Alternator, Synchronous motor and Three Phase Induction Motor.

UNIT III ANALOG ELECTRONICS 9

Resistor, Inductor and Capacitor in Electronic Circuits- Semiconductor Materials: Silicon &Germanium – PN Junction Diodes, Zener Diode –Characteristics Applications – Bipolar Junction Transistor-Biasing, JFET, SCR, MOSFET,IGBT – Types, I-V Characteristics and Applications, Rectifier and Inverters

UNIT IV DIGITAL ELECTRONICS 9

Review of number systems, binary codes, error detection and correction codes, Combinational logic - representation of logic functions-SOP and POS forms, K-map representations - minimizationusing K maps (Simple Problems only).

UNIT V MEASUREMENTS AND INSTRUMENTATION 9

Functional elements of an instrument, Standards and calibration, Operating Principle, types - Moving Coil and Moving Iron meters, Measurement of three phase power, Energy Meter, Instrument Transformers-CT and PT, DSO- Block diagram- Data acquisition.

TOTAL: 45 PERIODS

COURSE OUTCOMES :

After completing this course, the students will be able to

CO1: Compute the electric circuit parameters for simple problems

CO2: Explain the working principle and applications of electrical machines

CO3: Analyze the characteristics of analog electronic devices

CO4: Explain the basic concepts of digital electronics
CO5: Explain the operating principles of measuring instruments

TEXT BOOKS:

1. Kothari DP and I.J Nagrath, "Basic Electrical and Electronics Engineering", Second Edition,McGraw Hill Education, 2020
2. S.K.Bhattacharya "Basic Electrical and Electronics Engineering", Pearson Education,Second Edition, 2017.
3. Sedha R.S., "A textbook book of Applied Electronics", S. Chand & Co., 2008
4. James A .Svoboda, Richard C. Dorf, "Dorf's Introduction to Electric Circuits", Wiley, 2018.
5. A.K. Sawhney, Puneet Sawhney 'A Course in Electrical & Electronic Measurements &Instrumentation', Dhanpat Rai and Co, 2015.

REFERENCES:

1. Kothari DP and I.J Nagrath, "Basic Electrical Engineering", Fourth Edition, McGraw Hill
2. Education, 2019.
3. Thomas L. Floyd, 'Digital Fundamentals', 11th Edition, Pearson Education, 2017.
4. Albert Malvino, David Bates, 'Electronic Principles, McGraw Hill Education; 7th edition,2017.
5. Mahmood Nahvi and Joseph A. Edminister, "Electric Circuits", Schaum' Outline Series, McGraw Hill, 2002.
6. H.S. Kalsi, 'Electronic Instrumentation', Tata McGraw-Hill, New Delhi, 2010

22154S24 ENGINEERING GRAPHICS

L	T	P	C
2	0	4	4

COURSE OBJECTIVES:

The main learning objective of this course is to prepare the students for:

- Drawing engineering curves.
- Drawing a freehand sketch of simple objects.
- Drawing orthographic projection of solids and section of solids.
- Drawing development of solids
- Drawing isometric and perspective projections of simple solids.

CONCEPTS AND CONVENTIONS (Not for Examination)

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING 6+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.

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 6+12

Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes and parallel to the other by rotating object method. Visualization concepts and Free Hand sketching: Visualization principles —Representation of Three Dimensional objects — Layout of views- Freehand sketching of multiple views from pictorialviews of objects.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES 6 +12

Sectioning of above solids in simple vertical position when the cutting plane is inclined to 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.

Practicing three dimensional modeling of simple objects by CAD Software (Not for examination)

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.

Practicing three dimensional modeling of isometric projection of simple objects by CAD Software (Not for examination)

TOTAL: (L=30+P=60) 90 PERIODS

COURSE OUTCOMES:

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

- Use BIS conventions and specifications for engineering drawing.
- Construct the conic curves, involutes and cycloid.
- Solve practical problems involving projection of lines.
- Draw the orthographic, isometric and perspective projections of simple solids.
- Draw the development of simple solids.

TEXT BOOKS:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House,53rd Edition, 2019.
2. Natarajan K.V., “A Text Book of Engineering Graphics”, Dhanalakshmi Publishers,Chennai, 2018.
3. Parthasarathy, N. S. and Vela Murali, “Engineering Drawing”, Oxford University Press,2015

REFERENCES:

1. Basant Agarwal and Agarwal C.M., "Engineering Drawing", McGraw Hill, 2nd Edition, 2019.
2. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Publications, Bangalore, 27th Edition, 2017.
3. 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.
4. Parthasarathy N. S. and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson Education India, 2nd Edition, 2009.
6. Venugopal K. and Prabhu Raja V., "Engineering Graphics", New Age International (P) Limited,2008.

Publication of Bureau of Indian Standards:

1. IS 10711 — 2001: Technical products Documentation — Size and layout 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 permittto use appropriate scale to fit a solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

5. 221AIDS26 DATA STRUCTURES DESIGN

L T P C

3 0 0 3

COURSE OBJECTIVES:

- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I ABSTRACT DATA TYPES 9

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying

Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms

UNIT II LINEAR STRUCTURES 9

List ADT – array-based implementations – linked list implementations – singly linked lists –circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double ended queues

UNIT III SORTING AND SEARCHING 9

Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency

UNIT IV TREE STRUCTURES 9

Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi- way search trees

UNIT V GRAPH STRUCTURES 9

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees

TOTAL: 45 HOURS

COURSE OUTCOMES:

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

- explain abstract data types
- design, implement, and analyse linear data structures, such as lists, queues, and stacks,according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such assearching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOKS:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, “Data Structures andAlgorithms in Python” (An Indian Adaptation), Wiley, 2021.
2. Lee, Kent D., Hubbard, Steve, “Data Structures and Algorithms with Python” SpringerEdition 2015.
3. Narasimha Karumanchi, “Data Structures and Algorithmic Thinking with Python”Careermonk, 2015.

REFERENCES:

1. Rance D. Necaise, “Data Structures and Algorithms Using Python”, John Wiley & Sons,2011.
2. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein,“Introduction to Algorithms", Third Edition, PHI Learning, 2010.
3. Mark Allen Weiss, “Data Structures and Algorithm Analysis in C++”, Fourth Edition,Pearson Education, 2014
4. Aho, Hopcroft, and Ullman, “Data Structures and Algorithms”, Pearson Education India,2002.

22154L27

ENGINEERING PRACTICES LABORATORY L T P C0 0 4 2

COURSE OBJECTIVES:

The main learning objective of this course is to provide hands on training to thestudents in:

1. Drawing pipe line plan; laying and connecting various pipe fittings used in common household plumbing work; Sawing; planing; making joints in wood materials used in commonhousehold wood work.

2. Wiring various electrical joints in common household electrical wire work.

3. Welding various joints in steel plates using arc welding work; Machining various simple processes like turning, drilling, tapping in parts; Assembling simple mechanical assembly of common household equipments; Making a tray out of metal sheet using sheet metal work.

4. Soldering and testing simple electronic circuits; Assembling and testing simple electronic components on PCB.

GROUP – A (CIVIL & ELECTRICAL)

PART I CIVIL ENGINEERING PRACTICES 15

PLUMBING WORK:

a) Connecting various basic pipe fittings like valves, taps, coupling, unions,reducers,elbows and other components which are commonly used in household.

b) Preparing plumbing line sketches.

c) Laying pipe connection to the suction side of a pump

d) Laying pipe connection to the delivery side of a pump.

e) Connecting pipes of different materials: Metal, plastic and flexible pipesused inhousehold appliances.

WOOD WORK:

a) Sawing,

b) Planing and

c) Making joints like T-Joint, Mortise joint and Tenon joint and Dovetail joint.

Wood Work Study:

a) Studying joints in door panels and wooden furniture

b) Studying common industrial trusses using models.

PART II ELECTRICAL ENGINEERING PRACTICES 15

a) Introduction to switches, fuses, indicators and lamps - Basic switch boardwiring with lamp, fan and three pin socket
b) Staircase wiring
c) Fluorescent Lamp wiring with introduction to CFL and LED types.
d) Energy meter wiring and related calculations/ calibration
e) Study of Iron Box wiring and assembly
f) Study of Fan Regulator (Resistor type and Electronic type usingDiac/Triac/quadrac)
g) Study of emergency lamp wiring/Water heater

GROUP – B (MECHANICAL AND ELECTRONICS)

PART III MECHANICAL ENGINEERING PRACTICES 15

WELDING WORK:

a) Welding of Butt Joints, Lap Joints, and Tee Joints using arc welding.

b) Practicing gas welding.

BASIC MACHINING WORK:

a) (simple)Turning.

b) (simple)Drilling.

c) (simple)Tapping.

ASSEMBLY WORK:

a) Assembling a centrifugal pump.

b) Assembling a household mixer.

c) Assembling an airconditioner.

SHEET METAL WORK:

a) Making of a square tray

FOUNDRY WORK:

a) Demonstrating basic foundry operations.

PART IV ELECTRONIC ENGINEERING PRACTICES 15

SOLDERING WORK:

a) Soldering simple electronic circuits and checking continuity.

ELECTRONIC ASSEMBLY AND TESTING WORK:

a) Assembling and testing electronic components on a small PCB

ELECTRONIC EQUIPMENT STUDY:

a) Study an elements of smart phone..

b) Assembly and dismantle of LED TV.

c) Assembly and dismantle of computer/ laptop

COURSE OUTCOMES:

TOTAL : 60 PERIODS

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

- Draw pipe line plan; lay and connect various pipe fittings used in common household plumbing work; Saw; plan; make joints in wood materials used in common household wood work.
- Wire various electrical joints in common household electrical wire work.
- Weld various joints in steel plates using arc welding work; Machine various simple processes like turning, drilling, tapping in parts; Assemble simple mechanical assemblyof common household equipments; Make a tray out of metal sheet using sheet metal work.
- Solder and test simple electronic circuits; Assemble and test simple electronic components on PCB.

221AIDL28 DATA STRUCTURES DESIGN LABORATORY L T P C
0 0 4 2

COURSE OBJECTIVES:

- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

LIST OF EXPERIMENTS:

Note: The lab instructor is expected to design problems based on the topics listed. The Examination shall not be restricted to the sample experiments designed.

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs

7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees

22148S31A DISCRETE MATHEMATICS L T P C

3 1 0 4

COURSE OBJECTIVES:

- To extend student's logical and mathematical maturity and ability to deal with abstraction.
- To introduce most of the basic terminologies used in computer science courses and application of ideas to solve practical problems.
- To understand the basic concepts of combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

UNIT I LOGIC AND PROOFS 9 + 3

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT II COMBINATORICS 9 + 3

Mathematical induction – Strong induction and well ordering – The basics of counting – Thepigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT III GRAPHS 9 + 3

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 9 + 3

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 9 + 3

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra – Sub Boolean Algebra – Boolean Homomorphism.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students would :

CO1:Have knowledge of the concepts needed to test the logic of a program.

CO2:Have an understanding in identifying structures on many levels.

CO3:Be aware of a class of functions which transform a finite set into another finite set which relatesto input and output functions in computer science.

CO4:Be aware of the counting principles.
CO5:Be exposed to concepts and properties of algebraic structures such as groups, rings andfields.

TEXT BOOKS:

1. Rosen. K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGrawHill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2017.
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", 5thEdition, Pearson Education Asia, Delhi, 2013.
2. Koshy. T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.
3. Lipschutz. S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.

221AIDS32 DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION L T P C

3 0 2 4

COURSE OBJECTIVES:

- To analyze and design combinational circuits.
- To analyze and design sequential circuits
- To understand the basic structure and operation of a digital computer.
- To study the design of data path unit, control unit for processor and to familiarize with the hazards.
- To understand the concept of various memories and I/O interfacing.

UNIT I COMBINATIONAL LOGIC 9

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder –Subtractor – Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers - Demultiplexers

UNIT II SYNCHRONOUS SEQUENTIAL LOGIC 9

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment, circuit implementation - Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS 9

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation – Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR 9

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control, Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V MEMORY AND I/O 9

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits
6. Implementation of functions using Multiplexers.
7. Implementation of the synchronous counters
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer Architecture

COURSE OUTCOMES:

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

CO1 : Design various combinational digital circuits using logic gates

CO2 : Design sequential circuits and analyze the design procedures

CO3 : State the fundamentals of computer systems and analyze the execution of an instruction

CO4 : Analyze different types of control design and identify hazards

CO5 : Identify the characteristics of various memory systems and I/O communication

TOTAL:75 PERIODS

TEXT BOOKS

1. M. Morris Mano, Michael D. Ciletti, "Digital Design : With an Introduction to the Verilog HDL,VHDL, and System Verilog", Sixth Edition, Pearson Education, 2018.

2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

REFERENCES

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization andEmbedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

2. William Stallings, "Computer Organization and Architecture – Designing for Performance", TenthEdition, Pearson Education, 2016.

3. M. Morris Mano, "Digital Logic and Computer Design", Pearson Education, 2016.

221AIDC33 DATABASE DESIGN AND MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce database development life cycle and conceptual modeling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization

- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT I CONCEPTUAL DATA MODELING 8

Database environment – Database system development lifecycle – Requirements collection –Database design -- Entity-Relationship model – Enhanced-ER model – UML class diagrams.

UNIT II RELATIONAL MODEL AND SQL 10

Relational model concepts -- Integrity constraints -- SQL Data manipulation – SQL Data definition – Views -- SQL programming.

UNIT III RELATIONAL DATABASE DESIGN AND NORMALIZATION 10

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inferencerules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT IV TRANSACTION MANAGEMENT 8

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phaselocking techniques.

UNIT V OBJECT RELATIONAL AND NO-SQL DATABASES 9

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

TOTAL : 45 PERIODS

COURSE OUTCOMES

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

- Understand the database development life cycle and apply conceptual modeling
- Apply SQL and programming in SQL to create, manipulate and query the database
- Apply the conceptual-to-relational mapping and normalization to design relational database
- Determine the serializability of any non-serial schedule using concurrency techniques
- Apply the data model and querying in Object-relational and No-SQL databases.

TEXT BOOKS:

1. Thomas M. Connolly, Carolyn E. Begg, Database Systems – A Practical Approach to Design, Implementation, and Management, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, Fundamentals of Database Systems, 7th Edition, Pearson, 2017.

REFERENCES:

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING ANDDESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 6th

Edition, Tata Mc Graw Hill, 2011.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.
5. Raghu Ramakrishnan, “Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

221AIDC34 DESIGN AND ANALYSIS OF ALGORITHMS L T P C

3 0 2 4

COURSE OBJECTIVES:

- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To illustrate brute force and divide and conquer design techniques.
- To explain dynamic programming and greedy techniques for solving various problems.
- To apply iterative improvement technique to solve optimization problems
- To examine the limitations of algorithmic power and handling it in different problems.

UNIT I INTRODUCTION 8

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types –Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework - Asymptotic Notations and their properties – Empirical analysis - Mathematical analysis of Recursive and Non-recursive algorithms – Visualization.

UNIT II BRUTE FORCE AND DIVIDE AND CONQUER 10

Brute Force – String Matching - Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Multiplication of Large Integers and Strassen’s Matrix Multiplication – Closest-Pair and Convex - Hull Problems. Decrease and Conquer: - Topological Sorting – Transform and Conquer: Presorting – Heaps and Heap Sort.

UNIT III DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE 10

Dynamic programming – Principle of optimality - Coin changing problem – Warshall’s and Floyd‘s algorithms – Optimal Binary Search Trees - Multi stage graph - Knapsack Problem and Memory functions. Greedy Technique – Dijkstra’s algorithm - Huffman Trees and codes - 0/1 Knapsack problem.

UNIT IV ITERATIVE IMPROVEMENT 8

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V 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 – Traveling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem – Knapsack problem.

TOTAL: 45 PERIODS

PRACTICAL EXERCISES:

1. Implement recursive and non-recursive algorithms and study the order of growth from log2nto n!.

2. Divide and Conquer - Strassen’s Matrix Multiplication

3. Decrease and Conquer - Topological Sorting

4. Transform and Conquer - Heap Sort

5. Dynamic programming - Coin change Problem, Warshall’s and Floyd‘s algorithms, Knapsack Problem

6. Greedy Technique – Dijkstra’s algorithm, Huffman Trees and codes

7. Iterative improvement - Simplex Method

8. Backtracking – N-Queen problem, Subset Sum Problem

9. Branch and Bound - Assignment problem, Traveling Salesman Problem

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Analyze the efficiency of recursive and non-recursive algorithms mathematically

CO2: Analyze the efficiency of brute force, divide and conquer, decrease and conquer, Transformand conquer algorithmic techniques

CO3: Implement and analyze the problems using dynamic programming and greedy algorithmic techniques.

CO4: Solve the problems using iterative improvement techniques for optimization.

CO5: Compute the limitations of algorithmic power and solve the problems using backtracking and branch and bound techniques.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012.

REFERENCES:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.

2. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012.

3. S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.

4. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms,Pearson Education, Reprint 2006.

221AIDC35 **DATA EXPLORATION AND VISUALIZATION** **L T P C**
3 0 2 4

OBJECTIVES:

- To outline an overview of exploratory data analysis.
- To implement data visualization using Matplotlib.
- To perform univariate data exploration and analysis.
- To apply bivariate data exploration and analysis.
- To use Data exploration and visualization techniques for multivariate and time series data.

UNIT I EXPLORATORY DATA ANALYSIS 9

EDA fundamentals – Understanding data science – Significance of EDA – Making sense of data – Comparing EDA with classical and Bayesian analysis – Software tools for EDA - Visual Aids for EDA- Data transformation techniques-merging database, reshaping and pivoting, Transformation techniques - Grouping Datasets - data aggregation – Pivot tables and cross-tabulations.

UNIT II VISUALIZING USING MATPLOTLIB 9

Importing Matplotlib – Simple line plots – Simple scatter plots – visualizing errors – density and contour plots – Histograms – legends – colors – subplots – text and annotation – customization – three dimensional plotting - Geographic Data with Basemap - Visualization with Seaborn.

UNIT III UNIVARIATE ANALYSIS 9

Introduction to Single variable: Distributions and Variables - Numerical Summaries of Level and Spread - Scaling and Standardizing – Inequality - Smoothing Time Series.

UNIT IV BIVARIATE ANALYSIS 9

Relationships between Two Variables - Percentage Tables - Analyzing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations.

UNIT V MULTIVARIATE AND TIME SERIES ANALYSIS 9

Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data – Fundamentals of TSA – Characteristics of time series data – Data Cleaning – Time-based indexing – Visualizing – Grouping – Resampling.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Install the data Analysis and Visualization tool: R/ Python /Tableau Public/ Power BI.
2. Perform exploratory data analysis (EDA) on with datasets like email data set. Export all your emails as a dataset, import them inside a pandas data frame, visualize them and get differentinsights from the data.
3. Working with Numpy arrays, Pandas data frames , Basic plots using Matplotlib.
4. Explore various variable and row filters in R for cleaning data. Apply various plot features in Ron sample data sets and visualize.
5. Perform Time Series Analysis and apply the various visualization techniques.
6. Perform Data Analysis and representation on a Map using various Map data sets with Mouse Rollover effect, user interaction, etc..

7. Build cartographic visualization for multiple datasets involving various countries of the world;states and districts in India etc.
8. Perform EDA on Wine Quality Data Set.
9. Use a case study on a data set and apply the various EDA and visualization techniques and present an analysis report.

COURSE OUTCOMES:

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

CO1: Understand the fundamentals of exploratory data analysis.
CO2: Implement the data visualization using Matplotlib.
CO3: Perform univariate data exploration and analysis.
CO4: Apply bivariate data exploration and analysis.
CO5: Use Data exploration and visualization techniques for multivariate and time series data.

TOTAL: 75 PERIODS

TEXT BOOKS:

1. Suresh Kumar Mukhiya, Usman Ahmed, "Hands-On Exploratory Data Analysis with Python",Packt Publishing, 2020. (Unit 1)
2. Jake Vander Plas, "Python Data Science Handbook: Essential Tools for Working with Data", Oreilly, 1st Edition, 2016. (Unit 2)
3. Catherine Marsh, Jane Elliott, "Exploring Data: An Introduction to Data Analysis for SocialScientists", Wiley Publications, 2nd Edition, 2008. (Unit 3,4,5)

REFERENCES:

1. Eric Pimpler, Data Visualization and Exploration with R, GeoSpatial Training service, 2017.
2. Claus O. Wilke, "Fundamentals of Data Visualization", O'reilly publications, 2019.
3. Matthew O. Ward, Georges Grinstein, Daniel Keim, "Interactive Data Visualization: Foundations, Techniques, and Applications", 2nd Edition, CRC press, 2015.

221AIDC36	ARTIFICIAL INTELLIGENCE	L T P C
		3 0 0 3

COURSE OBJECTIVES:

The main objectives of this course are to:

- Learn the basic AI approaches
- Develop problem solving agents
- Perform logical and probabilistic reasoning

UNIT I INTELLIGENT AGENTS 9

Introduction to AI – Agents and Environments – concept of rationality – nature of environments – structure of agents. Problem solving agents – search algorithms – uninformed search strategies.

UNIT II PROBLEM SOLVING 9

Heuristic search strategies – heuristic functions. Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments

UNIT III GAME PLAYING AND CSP 9

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games. Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP.

UNIT IV LOGICAL REASONING 9

Knowledge-based agents – propositional logic – propositional theorem proving – propositionalmodel checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution.

UNIT V PROBABILISTIC REASONING 9

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

COURSE OUTCOMES:

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

CO1: Explain intelligent agent frameworks

CO2: Apply problem solving techniques

CO3: Apply game playing and CSP techniquesCO4: Perform logical reasoning

CO5: Perform probabilistic reasoning under uncertainty

TEXT BOOKS:

TOTAL:45 PERIODS

1. Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, FourthEdition, Pearson Education, 2021.

REFERENCES

1. Dan W. Patterson, “Introduction to AI and ES”, Pearson Education,2007
2. Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006
4. Deepak Khemani, “Artificial Intelligence”, Tata McGraw Hill Education, 2013.
5. http://nptel.ac.in/

221AIDL37 DATABASE DESIGN AND MANAGEMENT LABORATORY L T PC
0 0 3 1.5

COURSE OBJECTIVES:

- To understand the database development life cycle
- To learn database design using conceptual modeling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL programming

- To implement database applications using IDE/RAD tools
- To learn querying Object-relational databases

SUGGESTIVE EXPERIMENTS

1. Database Development Life cycle:

Problem definition and Requirement analysisScope and
Constraints

2. Database design using Conceptual modeling (ER-EER) – top-down approach

Mapping conceptual to relational database and validate using Normalization

3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming

- Stored Procedures/Functions
- Constraints and security using Triggers

6. Database design using Normalization – bottom-up approach
7. Develop database applications using IDE/RAD tools (Eg., NetBeans,VisualStudio)
8. Database design using EER-to-ODB mapping / UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
10. Querying the Object-relational database using Objet Query language

COURSE OUTCOMES

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

- Understand the database development life cycle
- Design relational database using conceptual-to-relational mapping, Normalization
- Apply SQL for creation, manipulation and retrieval of data
- Develop a database applications for real-time problems
- Design and query object-relational databases

TOTAL : 45 PERIODS

HARDWARE:

- Standalone Desktops

SOFTWARE:

- PostgreSQL

221AIDL38	**ARTIFICIAL INTELLIGENCE LABORATORY**	**L**	**T**	**P**	**C**
		0	**0**	**3**	**1.5**

OBJECTIVES:

- To design and implement search strategies
- To implement game playing techniques
- To implement CSP techniques
- To develop systems with logical reasoning
- To develop systems with probabilistic reasoning

LIST OF EXPERIMENTS:

1. Implement basic search strategies – 8-Puzzle, 8 - Queens problem, Cryptarithmetic.

2. Implement A* and memory bounded A* algorithms
3. Implement Minimax algorithm for game playing (Alpha-Beta pruning)
4. Solve constraint satisfaction problems
5. Implement propositional model checking algorithms
6. Implement forward chaining, backward chaining, and resolution strategies
7. Build naïve Bayes models
8. Implement Bayesian networks and perform inferences
9. Mini-Project

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Design and implement search strategies
CO2: Implement game playing and CSP techniquesCO3:
Develop logical reasoning systems
CO4: Develop probabilistic reasoning systems

22148S41A PROBABILITY AND STATISTICS L T P C3 1 0 4

COURSE OBJECTIVES

- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I PROBABILITY AND RANDOM VARIABLES 9 + 3

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 – Functions of a random variable.

UNIT II TWO- DIMENSIONAL RANDOM VARIABLES 9 + 3

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 ESTIMATION THEORY 9 + 3

Unbiased estimators - Efficiency - Consistency - Sufficiency - Robustness - Method of moments - Method of maximum Likelihood - Interval estimation of Means - Differences between means,variations and ratio of two variances

UNIT IV NON- PARAMETRIC TESTS 9 + 3

Introduction - The Sign test - The Signed - Rank test - Rank - sum tests - The U test - The H test -Tests based on Runs - Test of randomness - The Kolmogorov Tests .

UNIT V STATISTICAL QUALITY CONTROL 9 + 3

Control charts for measurements ($\overline{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agricultureand statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS

1. Johnson. R.A., Miller. I.R and Freund . J.E, " Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 9th Edition, 2016.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata Mc Graw Hill,4th Edition, 2007.
3. John E. Freund, "Mathematical Statistics", Prentice Hall, 5th Edition, 1992.

REFERENCES:

1. Gupta. S.C. and Kapoor. V. K., "Fundamentals of Mathematical Statistics", Sultan Chand &Sons, New Delhi, 12th Edition, 2020.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Ross. S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 5thEdition, Elsevier, 2014.
4. Spiegel. M.R., Schiller. J. and Srinivasan. R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill Edition, 4th Edition, 2012.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers andScientists", Pearson Education, Asia, 9th Edition, 2010.

221AIDC42 OPERATING SYSTEMS L T P C
3 0 2 4

COURSE OBJECTIVES:

- To understand the basics and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms and process synchronization.

- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To be familiar with I/O management and File systems.
- To be familiar with the basics of virtual machines and Mobile OS like iOS and Android**.**

UNIT I INTRODUCTION 7

Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods.

UNIT II PROCESS MANAGEMENT 11

Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The critical-section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III MEMORY MANAGEMENT 10

Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames –Thrashing.

UNIT IV STORAGE MANAGEMENT 10

Mass Storage system – Disk Structure - Disk Scheduling and 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; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem.

UNIT V VIRTUAL MACHINES AND MOBILE OS 7

Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Installation of Operating system : Windows/ Linux
2. Illustrate UNIX commands and Shell Programming
3. Process Management using System Calls : Fork, Exec, Getpid, Exit, Wait, Close
4. Write C programs to implement the various CPU Scheduling Algorithms
5. Illustrate the inter process communication strategy
6. Implement mutual exclusion by Semaphores
7. Write a C program to avoid Deadlock using Banker's Algorithm
8. Write a C program to Implement Deadlock Detection Algorithm

9. Write C program to implement Threading
10. Implement the paging Technique using C program
1. Write C programs to implement the following Memory Allocation Methods
a. First Fit b. Worst Fit c. Best Fit
2. Write C programs to implement the various Page Replacement Algorithms
3. Write C programs to Implement the various File Organization Techniques
4. Implement the following File Allocation Strategies using C programs
a. Sequential b. Indexed c. Linked
5. Write C programs for the implementation of various disk scheduling algorithms

COURSE OUTCOMES:

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

CO1: Analyze various scheduling algorithms and process synchronization.CO2 : Explain deadlock, prevention and avoidance algorithms.
CO3 : Compare and contrast various memory management schemes.
CO4 : Explain the functionality of file systems I/O systems, and VirtualizationCO5 : Compare iOS and Android Operating Systems.

TEXTBOOKS

TOTAL:75 PERIODS

1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2018.
2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.

REFERENCES

1. Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, TataMcGraw Hill Edition, 2010.
2. William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, PrenticeHall, 2018.
3. Achyut S.Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016.

221AIDC43 MACHINE LEARNING L T P C3 0 0 3

COURSE OBJECTIVES:

- To understand the basic concepts of machine learning.
- To understand and build supervised learning models.
- To understand and build unsupervised learning models.
- To evaluate the algorithms based on corresponding metrics identified

UNIT I INTRODUCTION TO MACHINE LEARNING 8

Review of Linear Algebra for machine learning; Introduction and motivation for machine learning; Examples of machine learning applications, Vapnik-Chervonenkis (VC) dimension, Probably Approximately Correct (PAC) learning, Hypothesis spaces, Inductive bias, Generalization, Bias variance trade-off.

UNIT II SUPERVISED LEARNING 11

Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Perceptron algorithm, Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random Forests

UNIT III ENSEMBLE TECHNIQUES AND UNSUPERVISED LEARNING 9

Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization.

UNIT IV NEURAL NETWORKS 9

Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout.

UNIT V DESIGN AND ANALYSIS OF MACHINE LEARNING EXPERIMENTS 8

Guidelines for machine learning experiments, Cross Validation (CV) and resampling – K-fold CV, bootstrapping, measuring classifier performance, assessing a single classification algorithm and comparing two classification algorithms – *t* test, McNemar's test, K-fold CV paired *t* test

COURSE OUTCOMES:

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

CO1**:** Explain the basic concepts of machine learning.

CO2 : Construct supervised learning models.

CO3 : Construct unsupervised learning algorithms.

CO4: Evaluate and compare different models

TOTAL:45 PERIODS

TEXTBOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
2. Stephen Marsland, "Machine Learning: An Algorithmic Perspective, "Second Edition", CRCPress, 2014.

REFERENCES:

1. Christopher M. Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.
2. Tom Mitchell, "Machine Learning", McGraw Hill, 3rd Edition, 1997.
3. Mehryar Mohri, Afshin Rostamizadeh, Ameet Talwalkar, "Foundations of Machine Learning", Second Edition, MIT Press, ~~2012~~, 2018.
4. Ian Goodfellow, Yoshua Bengio, Aaron Courville, "Deep Learning", MIT Press, 2016
5. Sebastain Raschka, Vahid Mirjalili , "Python Machine Learning", Packt publishing, 3rdEdition, 2019.

221AIDC44 FUNDAMENTALS OF DATA SCIENCE AND ANALYTICS L T P C
3 0 0 3

OBJECTIVES:

- To understand the techniques and processes of data science
- To apply descriptive data analytics
- To visualize data for various applications
- To understand inferential data analytics

- To analysis and build predictive models from data

UNIT I INTRODUCTION TO DATA SCIENCE 08

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications.

UNIT II DESCRIPTIVE ANALYTICS 10

Frequency distributions – Outliers –interpreting distributions – graphs – averages - describingvariability – interquartile range – variability for qualitative and ranked data - Normal distributions – z scores – correlation – scatter plots – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean.

UNIT III INFERENTIAL STATISTICS 09

Populations – samples – random sampling – Sampling distribution- standard error of the mean - Hypothesis testing – z-test – z-test procedure –decision rule – calculations – decisions – interpretations - one-tailed and two-tailed tests – Estimation – point estimate – confidence interval – level of confidence – effect of sample size.

UNIT IV ANALYSIS OF VARIANCE 09

t-test for one sample – sampling distribution of t – t-test procedure – t-test for two independent samples – p-value – statistical significance – t-test for two related samples. F-test – ANOVA – Two- factor experiments – three f-tests – two-factor ANOVA –Introduction to chi-square tests.

UNIT V PREDICTIVE ANALYTICS 09

Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling. Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – Time series analysis – moving averages – missing values – serial correlation – autocorrelation. Introduction to survival analysis.

TOTAL : 45 PERIODS

OUTCOMES:

Upon successful completion of this course, the students will be able to:CO1:
Explain the data analytics pipeline

CO2: Describe and visualize data

CO3 : Perform statistical inferences from data

CO4 : Analyze the variance in the data

CO5 : Build models for predictive analytics

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, “Introducing Data Science”, Manning Publications, 2016. (first two chapters for Unit I).
2. Robert S. Witte and John S. Witte, “Statistics”, Eleventh Edition, Wiley Publications, 2017.
3. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.

REFERENCES

1. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea

Press,2014.
2. Sanjeev J. Wagh, Manisha S. Bhende, Anuradha D. Thakare, “Fundamentals of Data Science”, CRC Press, 2022.
3. Chirag Shah, “A Hands-On Introduction to Data Science”, Cambridge University Press, 2020.
4. Vineet Raina, Srinath Krishnamurthy, “Building an Effective Data Science Practice: A Framework to Bootstrap and Manage a Successful Data Science Practice”, Apress, 2021.

221AIDC45	COMPUTER NETWORKS	L T P C
		3 0 2 4

COURSE OBJECTIVES:

- To understand the concept of layering in networks.
- To know the functions of protocols of each layer of TCP/IP protocol suite.
- To visualize the end-to-end flow of information.
- 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 APPLICATION LAYER 10

Data Communication - Networks – Network Types – Protocol Layering – TCP/IP Protocol suite –OSI Model – Introduction to Sockets - Application Layer protocols: HTTP – FTP – Email protocols (SMTP - POP3 - IMAP - MIME) – DNS – SNMP

UNIT II TRANSPORT LAYER 9

Introduction - Transport-Layer Protocols: UDP – TCP: Connection Management – Flow control - Congestion Control - Congestion avoidance (DECbit, RED) – SCTP – Quality of Service

UNIT III NETWORK LAYER 7

Switching : Packet Switching - Internet protocol - IPV4 – IP Addressing – Subnetting - IPV6, ARP, RARP, ICMP, DHCP

UNIT IV ROUTING 7

Routing and protocols: Unicast routing - Distance Vector Routing - RIP - Link State Routing – OSPF – Path-vector routing - BGP - Multicast Routing: DVMRP – PIM.

UNIT V DATA LINK AND PHYSICAL LAYERS 12

Data Link Layer – Framing – Flow control – Error control – Data-Link Layer Protocols – HDLC – PPP - Media Access Control – Ethernet Basics – CSMA/CD – Virtual LAN – Wireless LAN (802.11) - Physical Layer: Data and Signals - Performance – Transmission media- Switching – Circuit Switching.

45 PERIODS

PRACTICAL EXERCISES: 30 PERIODS

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route 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

4. Simulation of DNS using UDP sockets.
5. Use a tool like Wireshark to capture packets and examine the packets
6. Write a code simulating ARP /RARP protocols.
7. Study of Network simulator (NS) and Simulation of Congestion Control Algorithms using NS.
8. Study of TCP/UDP performance using Simulation tool.
9. Simulation of Distance Vector/ Link State Routing algorithm.
10. Simulation of an error correction code (like CRC)

COURSE OUTCOMES:

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

CO 1: Explain the basic layers and its functions in computer networks.

CO 2: Understand the basics of how data flows from one node to another.

CO 3: Analyze routing algorithms.

CO 4: Describe protocols for various functions in the network.

CO 5: Analyze the working of various application layer protocols.

TEXT BOOKS

TOTAL:75 PERIODS

1. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021.
2. Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 2022

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, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill, 2012.

		L	T	P	C
22149S46	**ENVIRONMENTAL SCIENCES AND SUSTAINABILITY**	**2**	**0**	**0**	**2**

UNIT I ENVIRONMENT AND BIODIVERSITY 6

Definition, scope and importance of environment – need for public awareness. Eco-system and Energy flow– ecological succession. Types of biodiversity: genetic, species and ecosystem diversity– values of biodiversity, India as a mega-diversity nation – hot-spots of biodiversity – threatsto biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ.

UNIT II ENVIRONMENTAL POLLUTION 9

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid, Hazardous and E-Waste management. Case studies on Occupational Health and Safety Management system (OHASMS). Environmental protection, Environmental protection acts .

UNIT III RENEWABLE SOURCES OF ENERGY 6

Energy management and conservation, New Energy Sources: Need of new sources. Different types new energy sources. Applications of- Hydrogen energy, Ocean energy resources, Tidal energy conversion. Concept, origin and power plants of geothermal energy.

UNIT IV SUSTAINABILITY AND MANAGEMENT 6

Development , GDP ,Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols-Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, Carbon Footprint. Environmental management in industry-A case study.

UNIT V SUSTAINABILITY PRACTICES 6

Zero waste and R concept, Circular economy, ISO 14000 Series, Material Life cycle assessment, Environmental Impact Assessment. Sustainable habitat: Green buildings, Green materials, Energy efficiency, Sustainable transports. Sustainable energy: Non-conventional Sources, Energy Cycles- carbon cycle, emission and sequestration, Green Engineering: Sustainable urbanization- Socio- economical and technological change.

TOTAL: 30 PERIODS

TEXT BOOKS:

1. Anubha Kaushik and C. P. Kaushik's "Perspectives in Environmental Studies", 6th Edition, New Age International Publishers ,2018.
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi,2016.
3. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition,Pearson Education, 2004.
4. Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
5. Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, Cengage learning.
6. Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
7. Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998.

REFERENCES :

1. R.K. Trivedi, 'Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards', Vol. I and II, Enviro Media. 38 . edition 2010.
2. Cunningham, W.P. Cooper, T.H. Gorhani, 'Environmental Encyclopedia', Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT. LTD, New

Delhi,2007.
4. Rajagopalan, R, ‘Environmental Studies-From Crisis to Cure’, Oxford University Press, ThirdEdition, 2015.
5. Erach Bharucha “Textbook of Environmental Studies for Undergraduate Courses” Orient Blackswan Pvt. Ltd. 2013.

221AIDL47 DATA SCIENCE AND ANALYTICS LABORATORY

L	T	P	C
0	0	4	2

OBJECTIVES:

- To develop data analytic code in python
- To be able to use python libraries for handling data
- To develop analytical applications using python
- To perform data visualization using plots

LIST OF EXPERIMENTS

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Working with Numpy arrays

1. Working with Pandas data frames
2. Basic plots using Matplotlib
3. Frequency distributions, Averages, Variability
4. Normal curves, Correlation and scatter plots, Correlation coefficient
5. Regression
6. Z-test
7. T-test
8. ANOVA
9. Building and validating linear models
10. Building and validating logistic models
11. Time series analysis

OUTCOMES:
PRACTICALS 60 PERIODS

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

CO1. Write python programs to handle data using Numpy and Pandas
CO2. Perform descriptive analytics
CO3. Perform data exploration using Matplotlib
CO4. Perform inferential data analytics
CO5. Build models of predictive analytics

REFERENCES

1. Jake VanderPlas, “Python Data Science Handbook”, O’Reilly, 2016.
2. Allen B. Downey, “Think Stats: Exploratory Data Analysis in Python”, Green Tea Press,2014.

3. Data Analysis and Visualization Using Python, Analyze Data to Create Visualizations forBI Systems — Dr. Ossama Embarak

221AIDL48	MACHINE LEARNING LABORATORY	L T P C
		0 0 4 2

OBJECTIVES:

- To understand the data sets and apply suitable algorithms for selecting the appropriate features for analysis.
- To learn to implement supervised machine learning algorithms on standard datasets and evaluate the performance.
- To experiment the unsupervised machine learning algorithms on standard datasets and evaluate the performance.
- To build the graph based learning models for standard data sets.
- To compare the performance of different ML algorithms and select the suitable one based on the application.

LIST OF EXPERIMENTS:

1. For a given set of training data examples stored in a .CSV file, implement and demonstrate the **Candidate-Elimination algorithm** to output a description of the set of all hypotheses consistent with the training examples.
2. Write a program to demonstrate the working of the decision tree based **ID3 algorithm**. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
3. Build an Artificial Neural Network by implementing the **Backpropagation algorithm** and test the same using appropriate data sets.
4. Write a program to implement the **naïve Bayesian classifier** for a sample training data set stored as a .CSV file and compute the accuracy with a few test data sets.
5. Implement **naïve Bayesian Classifier** model to classify a set of documents and measure the accuracy, precision, and recall.
6. Write a program to construct a **Bayesian network to** diagnose CORONA infection using standard WHO Data Set.
7. Apply **EM algorithm** to cluster a set of data stored in a .CSV file. Use the same data set for clustering using the k-Means **algorithm**. Compare the results of these two algorithms.
8. Write a program to implement ***k*-Nearest Neighbour algorithm** to classify the iris data set. Print both correct and wrong predictions.
9. Implement the non-parametric **Locally Weighted Regression algorithm** in order to fit data points. Select an appropriate data set for your experiment and draw graphs.

List of Equipments:(30 Students per Batch)

The programs can be implemented in either Python or R.

OUTCOMES:

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

TOTAL:60 PERIODS

CO1:Apply suitable algorithms for selecting the appropriate features for analysis. CO2:Implement

supervised machine learning algorithms on standard datasets and evaluate theperformance.
CO3:Apply unsupervised machine learning algorithms on standard datasets and evaluate the performance.
CO4:Build the graph based learning models for standard data sets.
CO5:Assess and compare the performance of different ML algorithms and select the suitable one based on the application.

221AIDC51 DEEP LEARNING LTPC
3 0 0 3

COURSEOBJECTIVES:

- Tounderstandandneedandprinciplesof deepneuralnetworks
- TounderstandCNNandRNNarchitecturesofdeepneuralnetworks
- Tocomprehendadvanceddeeplearningmodels
- Tolearntheevaluationmetricsfordeeplearningmodels

UNITI DEEPNETWORKSBASICS 9

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization – Machine Learning Basics: Capacity -- Overfitting and underfitting -- Hyperparameters and validation sets -- Estimators -- Bias and variance -- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feedforward networks; Regularization -- Optimization.

UNITII CONVOLUTIONALNEURALNETWORKS 9

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers --Gradient Computation.

UNITIII RECURRENTNEURALNETWORKS 10

Unfolding Graphs -- RNN Design Patterns: Acceptor -- Encoder --Transducer; Gradient Computation -- Sequence Modeling Conditioned on Contexts -- Bidirectional RNN -- Sequence to Sequence RNN – Deep Recurrent Networks -- Recursive Neural Networks -- Long Term Dependencies; Leaky Units: Skip connections and dropouts; Gated Architecture: LSTM.

UNITIV MODELEVALUATION 8

Performancemetrics--BaselineModels --Hyperparameters:ManualHyperparameter --Automatic Hyperparameter -- Grid search -- Random search -- Debugging strategies.

UNITV AUTOENCODERSANDGENERATIVEMODELS 9

Autoencoders: Undercomplete autoencoders -- Regularized autoencoders -- Stochastic encoders and decoders -- Learning with autoencoders; DeepGenerative Models: Variationalautoencoders – Generative adversarial networks.

TOTAL:45PERIODS

COURSEOUTCOMES

Afterthecompletionofthiscourse,studentswillbeableto:

CO1: Explainthebasicsindeepneuralnetworks

CO2: Apply Convolution Neural Network for image processing
CO3: ApplyRecurrentNeuralNetworkanditsvariantsfortextanalysis
CO4: Apply model evaluation for various applications
CO5: Applyautoencodersandgenerativemodelsforsuitableapplications

TEXTBOOK

1. IanGoodfellow,YoshuaBengio,AaronCourville,``DeepLearning",MITPress,2016.
2. AndrewGlassner,"DeepLearning:AVisualApproach",NoStarchPress,2021.

REFERENCES

1. Salman Khan, Hossein Rahmani, Syed Afaq Ali Shah, Mohammed Bennamoun, ``A Guide to Convolutional Neural Networks for Computer Vision", Synthesis Lectures on Computer Vision, Morgan & Claypool publishers, 2018.
2. Yoav Goldberg, ``Neural Network Methods for Natural Language Processing", Synthesis Lectures on Human Language Technologies, Morgan & Claypool publishers, 2017.
3. FrancoisChollet,``DeepLearningwithPython",ManningPublicationsCo,2018.
4. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook", Springer International Publishing, 2018.
5. Josh Patterson, Adam Gibson, ``Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017.

221AIDC52 DATAANDINFORMATIONSECURITY LTP C
3 0 0 3

COURSEOBJECTIVES:

- TounderstandthebasicsofInformationSecurity
- Toknowthelegal,ethicalandprofessionalissuesinInformationSecurity
- Toequipthestudents'knowledgeondigitalsignature,emailsecurityandwebsecurity

UNITI 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

UNITII SECURITYINVESTIGATION 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

UNITIII DIGITALSIGNATUREANDAUTHENTICATION 9

Digital Signature and Authentication Schemes: Digital signature-Digital Signature Schemes and their Variants- Digital Signature Standards-Authentication: Overview- Requirements Protocols - Applications - Kerberos -X.509 Directory Services

UNITIV E-MAILANDIPSECURITY 9

E-mail and IP Security: Electronic mail security: Email Architecture -PGP – Operational Descriptions- Key management- Trust Model- S/MIME.IP Security: Overview- Architecture - ESP, AH Protocols IPSec Modes – Security association - Key management.

UNITV WEBSECURITY 9

Web Security: Requirements- Secure Sockets Layer- Objectives-Layers -SSL secure communication-Protocols - Transport Level Security. Secure Electronic Transaction- Entities DS Verification-SET processing.

TOTAL:45PERIODS

COURSEOUTCOMES:

Uponsuccessfulcompletionofthiscourse,studentswillbeableto: CO1:
Understand the basics of data and information security

CO2: Understandthelegal,ethicalandprofessionalissuesininformationsecurity

CO3:Understandthevariousauthenticationschemestosimulatedifferentapplications.

CO4: Understand various security practices and system security standards

CO5:Understand the Web security protocols for E-Commerce applications

TEXTBOOKS:

1. MichaelEWhitmanandHerbertJMattord,"PrinciplesofInformationSecurity,Course Technology, 6th Edition, 2017.
2. StallingsWilliam.CryptographyandNetworkSecurity:PrinciplesandPractice,Seventh Edition, Pearson Education, 2017.

REFERENCES

1. HaroldF.Tipton,MickiKrauseNozaki,,"InformationSecurityManagementHandbook, Volume 6, 6th Edition, 2016.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", McGraw-Hill, Seventh Edition, 2012.
3. MattBishop,"ComputerSecurityArtandScience,AddisonWesleyReprintEdition,2015.
4. BehrouzAForouzan,DebdeepMukhopadhyay,CryptographyAndnetworksecurity,3rd Edition, . McGraw-Hill Education, 2015.

221AIDC53 DISTRIBUTEDCOMPUTING LTPC 3003

COURSEOBJECTIVES:

- Tointroducethecomputationandcommunicationmodelsofdistributedsystems
- Toillustratetheissuesofsynchronizationandcollectionofinformationindistributed systems
- Todescribedistributedmutualexclusionanddistributeddeadlockdetectiontechniques
- Toelucidateagreementprotocolsandfaulttolerancemechanismsindistributedsystems
- Toexplainthecloudcomputingmodelsandtheunderlying concepts

UNITI INTRODUCTION 8

Introduction: Definition-Relation to Computer System Components – Motivation – 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 of a Distributed System

.UNITII LOGICALTIMEANDGLOBALSTATE 10

LogicalTime: Physical Clock Synchronization: NTP – A Framework for a System of Logical Clocks – Scalar Time – Vector Time; Message Ordering and Group Communication: Message Ordering Paradigms – Asynchronous Execution with Synchronous Communication – Synchronous Program Order on Asynchronous System – Group Communication – Causal Order – Total Order; Global State and Snapshot Recording Algorithms: Introduction – System Model and Definitions – Snapshot Algorithms for FIFO Channels.

UNITIII DISTRIBUTEDMUTEXANDDEADLOCK 10

Distributed Mutual exclusion Algorithms: Introduction – Preliminaries – Lamport's algorithm – Ricart- Agrawala's Algorithm –– Token-Based Algorithms – Suzuki-Kasami's Broadcast Algorithm; Deadlock Detection in Distributed Systems: Introduction – System Model – Preliminaries – Models of Deadlocks – Chandy-Misra-Haas Algorithm for the AND model and OR Model.

UNITIV CONSENSUSANDRECOVERY 10

ConsensusandAgreement Algorithms: ProblemDefinition –Overviewof Results –Agreement ina Failure-Free System(Synchronous and Asynchronous) – Agreement in Synchronous Systems with Failures; Checkpointing and Rollback Recovery: Introduction – Background and Definitions – IssuesinFailureRecovery–Checkpoint-basedRecovery–CoordinatedCheckpointing Algorithm - -AlgorithmforAsynchronousCheckpointingandRecovery

UNITV CLOUDCOMPUTING 7

Definition of Cloud Computing – Characteristics of Cloud – Cloud Deployment Models – Cloud Service Models – Driving Factors and Challenges of Cloud – Virtualization – Load Balancing – Scalability and Elasticity – Replication – Monitoring – Cloud Services and Platforms: Compute Services – Storage Services – Application Services

TOTAL:45PERIODS

COURSEOUTCOMES:

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

CO1: Explain the foundations of distributed systems (K2)
CO2: Solvesynchronizationandstateconsistencyproblems(K3)
CO3 Useresourcesharingtechniquesindistributedsystems(K3)
CO4: Applyworkingmodelofconsensusandreliabilityofdistributedsystems(K3)
CO5: Explainthefundamentalsofcloudcomputing(K2)

TEXTBOOKS

1. KshemkalyaniAjayD,MukeshSinghal,"DistributedComputing:Principles,Algorithmsand Systems", Cambridge Press, 2011.

2. Mukesh Singhal, Niranjan G Shivaratri, "Advanced Concepts in Operating systems", Mc-Graw Hill Publishers, 1994.

REFERENCES

1. GeorgeCoulouris,JeanDollimore,TimeKindberg,"DistributedSystemsConceptsand Design", Fifth Edition, Pearson Education, 2012.
2. PradeepLSinha,"DistributedOperatingSystems:ConceptsandDesign",PrenticeHallo f India, 2007.
3. TanenbaumAS,VanSteenM,"DistributedSystems:PrinciplesandParadigms",Pearso n Education, 2007.
4. LiuML,"DistributedComputing:PrinciplesandApplications",PearsonEducation,2004.
5. NancyALynch,"DistributedAlgorithms",MorganKaufmanPublishers,2003.
6. ArshdeepBagga,VijayMadisetti,"CloudComputing:AHands-OnApproach",Universities Press, 2014.

221AIDC54 BIGDATAANALYTICS LTPC
202 3

COURSEOBJECTIVES:

- Tounderstandbig data.
- TolearnanduseNoSQLbigdatamanagement.
- TolearnmapreduceanalyticsusingHadoopandrelatedtools.
- Toworkwithmapreduce applications
- TounderstandtheusageofHadooprelatedtoolsforBigDataAnalytics

UNITI UNDERSTANDINGBIGDATA 5

Introductiontobig data –convergenceofkeytrends –unstructureddata –industryexamplesof big data–webanalytics–bigdataapplications–bigdatatechnologies–introductiontoHadoop– open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNITII NOSQLDATAMANAGEMENT 7

Introduction to NoSQL – aggregate data models – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients

UNITIV MAPREDUCE APPLICATIONS 6

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

UNITIII **BASICSOFHADOOP** **6**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT V **HADOOP RELATEDTOOLS** **6**

Hbase–datamodelandimplementations–Hbaseclients–Hbaseexamples–praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive–datatypesandfileformats –HiveQLdatadefinition–HiveQLdatamanipulation –HiveQL queries.

COURSEOUTCOMES:

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

CO1: Describebigdataandusecasesfromselectedbusinessdomains.

CO2: Explain NoSQL big data management.

CO3: Install,configure,andrunHadoopandHDFS.

CO4: Performmap-reduceanalyticsusingHadoop.

CO5: UseHadoop-relatedtoolssuchasHBase,Cassandra,Pig,andHiveforbigdataanalytics.

LISTOF EXPERIMENTS:

DownloadingandinstallingHadoop;UnderstandingdifferentHadoopmodes.Startupscripts, Configuration files.

1. HadoopImplementationoffilemanagementtasks,suchasAddingfilesanddirectories, retrieving files and Deleting files
2. ImplementofMatrixMultiplicationwithHadoopMapReduce
3. RunabasicWordCountMapReduceprogramtounderstandMapReduceParadigm.
4. InstallationofHivealongwithpracticeexamples.
5. InstallationofHBase,InstallingthriftalongwithPracticeexamples
6. Practiceimportingandexportingdatafromvariousdatabases.

a. SoftwareRequirements:

i.Cassandra,Hadoop,Java,Pig,HiveandHBase.

TOTAL:60PERIODS

TEXTBOOKS:

1. MichaelMinelli,MichelleChambers,andAmbigaDhiraj,"BigData,BigAnalytics:Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. EricSammer,"HadoopOperations",O'Reilley,2012.
3. Sadalage,PramodJ.“NoSQLdistilled”,2013

REFERENCES:

1. E.Capriolo,D.Wampler,andJ.Rutherglen,"ProgrammingHive",O'Reilley,2012.
2. LarsGeorge,"HBase:TheDefinitiveGuide",O'Reilley,2011.
3. EbenHewitt,"Cassandra:TheDefinitiveGuide",O'Reilley,2010.
4. AlanGates,"ProgrammingPig",O'Reilley,2011.

221AIDC51 DEEPLEARNINGLABORATORY LTP C
004 2

COURSEOBJECTIVES:

- Tounderstandthetoolsandtechniquestoimplementdeepneuralnetworks
- Toapplydifferentdeeplearningarchitecturesforsolvingproblems
- Toimplementgenerativemodelsforsuitableapplications
- Tolearntobuildandvalidatedifferentmodels

LISTOF EXPERIMENTS:

1. SolvingXORproblemusingDNN
2. CharacterrecognitionusingCNN
3. Facerecognitionusing CNN
4. LanguagemodelingusingRNN
5. SentimentanalysisusingLSTM
6. PartsofspeechtaggingusingSequencetoSequencearchitecture
7. MachineTranslationusingEncoder-Decodermodel
8. ImageaugmentationusingGANs
9. Mini-projectonrealworldapplications

TOTAL:60PERIODS

COURSEOUTCOMES:

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

CO1: Apply deep neural network for simple problems (K3)

CO2: ApplyConvolutionNeuralNetworkforimageprocessing(K3
)

CO3: ApplyRecurrentNeuralNetworkanditsvariantsfortextanalysis(K3)

CO4: Applygenerativemodelsfordataaugmentation(K3)

CO5: Developreal-worldsolutionsusingsuitabledeepneuralnetworks(K4)

CO’s-PO’s&PSO’sMAPPING

22152S61 EMBEDDED SYSTEMS AND IOT LTP C
302 4

COURSEOBJECTIVES:

- Tolearntheinternalarchitectureandprogrammingofanembeddedprocessor.
- TointroduceinterfacingI/Odevicestotheprocessor.
- TointroducetheevolutionoftheInternetofThings(IoT).
- Tobuildasmalllow-costembeddedandIoTsystemusingArduino/RaspberryPi/open platform.
- ToapplytheconceptofInternetofThingsinrealworldscenario.

UNITI 8-BITEMBEDDEDPROCESSOR 9

8-Bit Microcontroller – Architecture – Instruction Set and Programming – Programming Parallel Ports – Timers and Serial Port – Interrupt Handling.

UNITII EMBEDDEDCPROGRAMMING 9

MemoryAndI/O Devices Interfacing – Programming EmbeddedSystems in C – Need For RTOS– Multiple Tasks and Processes – Context Switching – Priority Based Scheduling Policies.

UNITIII IOTANDARDUINOPROGRAMMING 9

IntroductiontotheConceptofIoTDevices–IoTDevicesVersus
Computers – IoT Configurations – Basic Components – Introduction to Arduino – Types of Arduino –ArduinoToolchain–ArduinoProgrammingStructure–Sketches–Pins–Input/OutputFromPins Using Sketches – Introduction to Arduino Shields – Integration of Sensors and Actuators with Arduino.

UNITIV IOTCOMMUNICATIONANDOPENPLATFORMS 9

IoT Communication Models and APIs – IoT Communication Protocols – Bluetooth –WiFi – ZigBee – GPS – GSM modules – Open Platform (like Raspberry Pi) – Architecture – Programming – Interfacing – Accessing GPIO Pins – Sending and Receiving Signals Using GPIO Pins – Connecting to the Cloud.

UNITV APPLICATIONSDEVELOPMENT 9

Complete Design of Embedded Systems – Development of IoT Applications – Home Automation – Smart Agriculture – Smart Cities – Smart Healthcare.

22147S71 HUMANVALUESANDETHICS LTPC
2002

COURSEDESCRIPTION

This course aims to provide a broad understanding about the modern values and ethical principles that have evolved and are enshrined in the Constitution of India with regard to the democratic, secular and scientific aspects. The course is designed for undergraduate students so that they could study, understand and apply these values in their day to day life.

COURSEOBJECTIVES:

- TocreateawarenessaboutvaluesandethicsenshrinedintheConstitutionofIndia
- Tosensitizestudentsaboutthedemocraticvaluestobeupheldinthemodernsociety.
- Toinculcaterespectforallpeopleirrespectiveoftheirreligionorotheraffiliations.
- Toinstillthescientifictemperinthestudents’mindsanddeveloptheircriticalthinking.
- Topromotesenseofresponsibilityandunderstandingofthedutiesofcitizen.

UNITI DEMOCRATICVALUES 6

Understanding Democratic values: Equality, Liberty, Fraternity, Freedom, Justice, Pluralism, Tolerance, Respect for All, Freedom of Expression, Citizen Participation in Governance – World

Democracies: French Revolution, American Independence, Indian Freedom Movement.ReadingText:ExcerptsfromJohnStuartMills'*OnLiberty*

UNITII SECULARVALUES 6

Understanding Secular values – Interpretation of secularism in Indian context - Disassociation of state from religion – Acceptance of all faiths – Encouraging non-discriminatory practices.
ReadingText:Excerptfrom*SecularisminIndia:ConceptandPractice*byRamPuniyani

UNITIII SCIENTIFICVALUES 6

Scientific thinking and method: Inductive and Deductive thinking, Proposing and testingHypothesis, Validating facts using evidence based approach – Skepticism and Empiricism – Rationalism and Scientific Temper.

ReadingText:Excerptfrom*TheScientificTemper*byAntonyMichaelisR

UNITIV SOCIALETHICS 6

Application of ethical reasoning to social problems – Gender bias and issues – Gender violence – Social discrimination – Constitutional protection and policies – Inclusive practices.

ReadingText:Excerptfrom*21Lessonsforthe21stCentury*byYuvalNoahHarari

UNITV SCIENTIFICETHICS 6

TransparencyandFairnessinscientificpursuits–Scientificinventionsforthebettermentofsociety -Unfairapplicationofscientificinventions–RoleandResponsibilityofScientistinthemodern society.

ReadingText:Excerptfrom*AmericanPrometheus:TheTriumphandTragedyofJ.Robert Oppenheimer* by Kai Bird and Martin J. Sherwin.

TOTAL:30PERIODS

REFERENCES:

1. TheNonreligious:UnderstandingSecularPeopleandSocieties,LukeW.GalenOxford University Press, 2016.
2. Secularism:ADictionaryofAtheism,Bullivant,Stephen;Lee,Lois,OxfordUniversityPress , 2016.
3. TheOxfordHandbookofSecularism,JohnR.Shook,OxfordUniversityPress,2017.
4. The Civic Culture: Political Attitudes and Democracy in Five Nations by Gabriel A. Almond and Sidney Verba, Princeton University Press,
5. ResearchMethodologyforNaturalSciencesbySoumitroBanerjee,IIScPress,January2022

COURSEOUTCOMES

Studentswillbeableto

CO1: Identifytheimportanceofdemocratic,secularandscientificvaluesinharmonious functioning of social life

CO2:Practicedemocraticandscientificvaluesinboththeirpersonalandprofessionallife. CO3 :Find rational solutions to social problems.
CO4:Behaveinanethicalmannerinsociety
CO5:Practicecriticalthinkingandthepursuitoftruth.

221AIDC81 **PROJECTWORK/INTERNSHIP** **LTPC**
002010

COURSEOBJECTIVES:

- Totrainthestudents
- For gaining domain knowledge, and technical skills to solve potential business / researchproblems
- GatherrequirementsandDesignsuitablesoftwaresolutionsandevaluate
- alternatives
- Toworkinsmallteamsandunderstandtheprocessesandpracticesinthe‘industry.
- Implement,Testanddeploysolutionsfortargetplatforms
- Preparingprojectreportsandpresentation

The students shall individually / or as group work on business/research domains and related problems approved by the Department / organization that offered the internship / project.

The student can selectanytopic which is relevant to his/her specialization of the programme.The student should continue the work on the selected topic as per theformulated methodology. At the end of the semester, after completing the work to the satisfaction of the supervisor and review committee, a detailed report which contains clear definition of the identified problem, detailed literature review related to the area of work and methodology for carrying out the work, resultsand discussion, conclusion and references should be prepared as per the format prescribed bythe Universityand submittedtotheHead of the department. Thestudentswill be evaluated based on the report and viva-voce examination by a panel of examiners as per the Regulations.

TOTAL:300PERIODS

COURSEOUTCOMES:
Attheendoftheproject,thestudentwillbeableto
CO1:GainDomainknowledgeandtechnicalskillsetrequiredforsolving industry/ research problems
CO2:Providesolutionarchitecture,moduleleveldesigns,algorithms
CO3: Implement, test and deploy the solution for the target platform
CO4:Preparedetailedtechnicalreport,demonstrateandpresentthework

221AIDC55A **KNOWLEDGEENGINEERING** **LTP C**
200 3

COURSEOBJECTIVES:

- TounderstandthebasicsofKnowledgeEngineering.
- TodiscussmethodologiesandmodelingforAgentDesignandDevelopment.
- Todesignanddevelopontologies.
- Toapplyreasoningwithontologiesandrules.
- Tounderstandlearningandrulelearning.

UNITI REASONINGUNDERUNCERTAINTY 6

Introduction – Abductive reasoning – Probabilistic reasoning: Enumerative Probabilities – Subjective Bayesian view – Belief Functions – Baconian Probability – Fuzzy Probability – Uncertainty methods - Evidence-based reasoning – Intelligent Agent – Mixed-Initiative Reasoning– Knowledge Engineering.

UNITII METHODOLOGYANDMODELING 6

Conventional Design and Development – Development tools and Reusable Ontologies – Agent Design and Development using Learning Technology – Problem Solving through Analysis and Synthesis – Inquiry-driven Analysis and Synthesis – Evidence-based Assessment – Believability Assessment – Drill-Down Analysis, Assumption-based Reasoning, and What-If Scenarios.

UNITIII ONTOLOGIES–DESIGNANDDEVELOPMENT 6

Concepts and Instances – Generalization Hierarchies – Object Features – Defining Features – Representation – Transitivity – Inheritance – Concepts as Feature Values – Ontology Matching. Design and Development Methodologies – Steps in Ontology Development – Domain Understanding and Concept Elicitation – Modelling-based Ontology Specification.

UNITIV REASONIINGWITHONTOLOGIESANDRULES 6

Production System Architecture – Complex Ontology-based Concepts – Reduction and Synthesis rules and the Inference Engine – Evidence-based hypothesis analysis – Rule and Ontology Matching – Partially Learned Knowledge – Reasoning with Partially Learned Knowledge.

UNITV LEARNINGANDRULELEARNING 6

Machine Learning – Concepts – Generalization and Specialization Rules – Types – Formal definition of Generalization. Modelling, Learning and Problem Solving – Rule learning and Refinement – Overview – Rule Generation and Analysis – Hypothesis Learning.

PRACTICALEXERCISES:30PERIODS

1. PerformoperationswithEvidenceBasedReasoning.
2. PerformEvidencebasedAnalysis.
3. PerformoperationsonProbabilityBasedReasoning.
4. PerformBelievabilityAnalysis.
5. ImplementRuleLearningandrefinement.
6. Performanalysisbasedonlearnedpatterns.
7. ConstructionofOntologyforagivendomain.

COURSEOUTCOMES:

Attheendofthiscourse,thestudentswillbeableto:

CO1: Understand the basics of Knowledge Engineering.

CO2:ApplymethodologiesandmodellingforAgentDesignandDevelopment.

CO3:Designanddevelopontologies.

CO4: Applyreasoningwithontologiesandrules.

CO5:Understandlearningandrulelearning.

TOTAL:60PERIODS

TEXTBOOKS:

1.Gheorghe Tecuci, Dorin Marcu, Mihai Boicu, David A. Schum, Knowledge Engineering Building Cognitive Assistants for Evidence-based Reasoning, Cambridge University Press, First Edition, 2016. (Unit 1 – Chapter 1 / Unit 2 – Chapter 3,4/ Unit 3 – Chapter 5, 6 / Unit 4-7,Unit5–Chapter8, 9)

REFERENCES:

1. RonaldJ.Brachman,HectorJ.Levesque:KnowledgeRepresentationandReasoning , Morgan Kaufmann, 2004.

2. ElaKumar,KnowledgeEngineering,IKInternationalPublisherHouse,2018.

3. JohnF.Sowa:KnowledgeRepresentation:Logical,Philosophical,andComputational Foundations, Brooks/Cole, Thomson Learning, 2000.

4. King,KnowledgeManagementandOrganizationalLearning,Springer,2009.
JayLiebowitz,KnowledgeManagementLearningfromKnowledgeEngineering,1st Edition,2001

221AIDC55B	RECOMMENDERSYSTEMS	LTP C
		20 23

COURSEOBJECTIVES:

- Tounderstandthefoundationsoftherecommendersystem.
- Tolearnthesignificanceofmachinelearninganddataminingalgorithmsfor Recommender systems
- Tolearnaboutcollaborativefiltering
- Tomakestudentsdesignandimplementarecommendersystem.
- Tolearncollaborativefiltering.

UNIT INTRODUCTION 6

Introduction and basic taxonomy of recommender systems - Traditional and non-personalized Recommender Systems - Overview of data mining methods for recommender systems- similarity measures- Dimensionality reduction – Singular Value Decomposition (SVD)

Suggested Activities:

- Practicallearning–ImplementDatasimilaritymeasures.
- ExternalLearning–SingularValueDecomposition(SVD)applications

SuggestedEvaluationMethods:

- QuizonRecommendersystems.
- QuizofpythontoolsavailableforimplementingRecommendersystems

UNITII CONTENT-BASEDRECOMMENDATIONSYSTEMS

6

High-level architecture of content-based systems - Item profiles, Representing item profiles, Methods for learning user profiles, Similarity-based retrieval, and Classification algorithms.

Suggested Activities:

- Assignmentoncontent-basedrecommendationsystems
- Assignmentoflearninguserprofiles

SuggestedEvaluationMethods:

- Quizonsimilarity-basedretrieval.
- Quizofcontent-basedfiltering

UNITIII COLLABORATIVEFILTERING 6

A systematic approach, Nearest-neighbor collaborative filtering (CF), user-based and item-based CF, components of neighborhood methods (rating normalization, similarity weight computation,and neighborhood selection

Suggested Activities:

- Practicallearning–Implementcollaborativefilteringconcepts
- Assignmentofsecurityaspectsofrecommendersystems

SuggestedEvaluationMethods:

- Quizoncollaborativefiltering
- Seminaronsecuritymeasuresofrecommendersystems

UNITIV ATTACK-RESISTANTRECOMMENDERSYSTEMS 6

Introduction–TypesofAttacks–Detectingattacksonrecommendersystems –Individualattack – Group attack – Strategies for robust recommender design - Robust recommendation algorithms.

Suggested Activities:

- GroupDiscussiononattacksandtheirmitigation
- Studyoftheimpactofgroupattacks
- ExternalLearning–Useof CAPTCHAs

SuggestedEvaluationMethods:

- Quizonattacksonrecommendersystems
- SeminaronpreventingattacksusingtheCAPTCHAs

UNITV EVALUATINGRECOMMENDERSYSTEMS 6

EvaluatingParadigms–UserStudies–OnlineandOfflineevaluation–Goalsof evaluationdesign – Design Issues – Accuracy metrics – Limitations of Evaluation measures

Suggested Activities:

- GroupDiscussionongoalsofevaluationdesign
- Studyofaccuracymetrics

SuggestedEvaluationMethods:

- Quizonevaluationdesign
- Problems on accuracy measures

30PERIODS PracticalExercises

30 PERIODS

1. ImplementDatasimilaritymeasuresusingPython
2. Implementdimensionreductiontechniquesforrecommendersystems
3. Implementuserprofilelearning
4. Implementcontent-basedrecommendationsystems
5. Implementcollaborativefiltertechniques
6. Createanattackfortamperingwithrecommendersystems
7. ImplementaccuracymetricslikeReceiverOperatedCharacteristiccurves

TOTAL:60PERIODS

COURSEOUTCOMES:

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

CO1: Understandthebasicconceptsofrecommendersystems.

CO2: Implement machine-learning and data-mining algorithms in recommender systems data sets.

CO3: ImplementationofCollaborativeFilteringincarryingoutperformanceevaluationof recommender systems based on various metrics.

CO4: Designandimplementasimplerecommendersystem.

CO5: Learnaboutadvancedtopicsofrecommendersystems.

CO6: Learnaboutadvancedtopicsofrecommendersystemsapplications

TEXTBOOKS:

1. CharuC.Aggarwal,RecommenderSystems:TheTextbook,Springer,2016.
2. DietmarJannach,MarkusZanker,AlexanderFelfernig and GerhardFriedrich, Recommender Systems: An Introduction, Cambridge University Press (2011), 1st ed.
3. FrancescoRicci, Lior Rokach, BrachaShapira,Recommender SytemsHandbook, 1st ed, Springer (2011),
4. Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Mining of massive datasets, 3rdedition, Cambridge University Press, 2020.

221AIDC55C	SOFTCOMPUTING	LTPC
		202 3

COURSEOBJECTIVES:

- Tointroducetheideasoffuzzysets,fuzzylogicanduseofheuristicsbasedonhuman experience.

- To provide the mathematical background for carrying out the optimization associated with neural network learning
- TolearnvariousevolutionaryAlgorithms.
- Tobecomefamiliarwithneuralnetworksthatcanlearnfromavailableexamplesandg eneralize to form appropriate rules for inference systems.
- Tointroducecasestudiesutilizingtheaboveandillustratethe Intelligent behavior of programs based on soft computing

UNITI INTRODUCTIONTOSOFTCOMPUTINGANDFUZZYLOGIC 6

Introduction - Fuzzy Logic - Fuzzy Sets, Fuzzy Membership Functions, Operations on Fuzzy Sets, Fuzzy Relations, Operations on Fuzzy Relations, Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems

UNITII NEURALNETWORKS 6

Supervised Learning Neural Networks – Perceptrons - Backpropagation -Multilayer Perceptrons – Unsupervised Learning Neural Networks –Kohonen Self-Organizing Networks

UNITIII GENETICALGORITHMS 6

Chromosome Encoding Schemes -Population initialization and selection methods - Evaluation function - Genetic operators- Cross over – Mutation - Fitness Function – Maximizing function

UNITIVNEUROFUZZY MODELING 6

ANFIS architecture – hybrid learning – ANFIS as universal approximator – Coactive Neuro fuzzy modeling – Framework – Neuron functions for adaptive networks – Neuro fuzzy spectrum - Analysis of Adaptive Learning Capability

UNITVAPPLICATIONS 6

Modeling a two input sine function - Printed Character Recognition – Fuzzy filtered neural networks – Plasma Spectrum Analysis – Hand written neural recognition - Soft Computing for Color Recipe Prediction.

30 PERIODS

OUTCOMES:

CO1:Understand the fundamentals of fuzzy logic operators and inference mechanisms

CO2:UnderstandneuralnetworkarchitectureforAIapplicationssuchasclassificationand clustering

CO3:LearnthefunctionalityofGeneticAlgorithmsinOptimizationproblems

CO4:Use hybrid techniques involving Neural networks and Fuzzy logic

CO5:Apply soft computing techniques in real world applications

PRACTICALEXERCISES 30PERIODS

1. Implementationoffuzzycontrol/inferencesystem
2. Programmingexerciseonclassificationwithadiscreteperceptron
3. ImplementationofXORwithbackpropagationalgorithm
4. Implementationofselforganizingmapsforaspecificapplication
5. ProgrammingexercisesonmaximizingafunctionusingGeneticalgorithm

6. Implementationoftwoinputsinefunction
7. Implementationofthreeinputnonlinearfunction

TOTAL:60PERIODS

TEXTBOOKS:

1. SaJANG, J.-S. R., SUN, C.-T., & MIZUTANI, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Upper Saddle River, NJ, Prentice Hall,1997
2. HimanshuSingh,YunisAhmadLone,DeepNeuro-FuzzySystemswithPython
3. WithCaseStudiesandApplicationsfromtheIndustry,Apress,2020

REFERENCES

1. roj Kaushik andSunitaTiwari, Soft Computing-FundamentalsTechniquesand Applications, 1st Edition, McGraw Hill, 2018.
2. S. Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
3. Samir Roy, Udit Chakraborthy, Introduction to Soft Computing, Neuro Fuzzy and GeneticAlgorithms, Pearson Education, 2013.
4. S.N. Sivanandam, S.N. Deepa, Principles of Soft Computing, Third Edition, Wiley India Pvt Ltd, 2019.
5. R.Eberhart,P.SimpsonandR.Dobbins,“ComputationalIntelligence-PCTools”,AP ofessional,Boston, 1996

221AIDC55D TEXTANDSPEECH ANALYSIS LTPC
2023

COURSEOBJECTIVES:

- Understandnaturallanguageprocessingbasics
- Applyclassificationalgorithmstotextdocuments
- Buildquestion-answeringanddialoguesystems
- Developaspeechrecognitionsystem
- Developaspeechsynthesizer

UNITI NATURALLANGUAGEBASICS 6

Foundations of natural language processing – Language Syntax and Structure- TextPreprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop- words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model

Suggested Activities

- FlippedclassroomonNLP
- ImplementationofTextPreprocessingusingNLTK
- ImplementationofTF-IDFmodels

SuggestedEvaluationMethods

- QuizonNLP Basics

- DemonstrationofPrograms

UNITII TEXTCLASSIFICATION 6

Vector Semantics and Embeddings -Word Embeddings - Word2Vec model – Glove model – FastText model – Overview of Deep Learning models – RNN – Transformers – Overview of Text summarization and Topic Models

Suggested Activities
- FlippedclassroomonFeatureextractionof documents
- ImplementationofSVMmodelsfortext classification
- Externallearning:TextsummarizationandTopicmodels

SuggestedEvaluationMethods
- Assignmentonabovetopics
- QuizonRNN,Transformers
- ImplementingNLPwithRNNandTransformers

UNITIII QUESTIONANSWERINGANDDIALOGUESYSTEMS 9

Information retrieval – IR-based question answering – knowledge-based question answering – language models for QA – classic QA models – chatbots – Design of dialogue systems -– evaluating dialogue systems

Suggested Activities:
- Flippedclassroomonlanguagemodelsfor QA
- Developingaknowledge-basedquestion-answeringsystem
- ClassicQAmodeldevelopment

SuggestedEvaluationMethods
- Assignmentontheabovetopics
- Quizonknowledge-basedquestionansweringsystem
- Developmentofsimplechatbots

UNITIV TEXT-TO-SPEECHSYNTHESIS 6

Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing - Concatenative and parametricapproaches, WaveNet and other deep learning-based TTS systems

Suggested Activities:
- FlippedclassroomonSpeechsignalprocessing
- ExploringTextnormalization
- Datacollection
- ImplementationofTTSsystems

SuggestedEvaluationMethods

- Assignmentontheabovetopics
- Quizonwavenet,deeplearning-basedTTSsystems
- FindingaccuracywithdifferentTTSsystems

UNITV AUTOMATICSPEECHRECOGNITION 6

Speechrecognition:Acousticmodelling–FeatureExtraction-HMM,HMM-DNNsystems

Suggested Activities:

- FlippedclassroomonSpeechrecognition.
- ExploringFeatureextraction

SuggestedEvaluationMethods

- Assignmentontheabovetopics
- Quizonacousticmodelling

PRACTICALEXERCISES 30 PERIODS

1. CreateRegularexpressionsinPythonfordetectingwordpatternsandtokenizingtext
2. GettingstartedwithPythonandNLTK-SearchingText,CountingVocabulary,Frequency Distribution, Collocations, Bigrams
3. AccessingTextCorporausingNLTKinPython
4. Writeafunctionthatfindsthe50mostfrequentlyoccurring wordsof atext that arenot stop words.
5. ImplementtheWord2Vecmodel
6. Useatransformerforimplementing classification
7. Designachatbotwithasimpledialogsystem
8. Converttexttospeechandfindaccuracy
9. Designaspeechrecognitionsystemandfindtheerror rate

TOTAL:60PERIODS

COURSEOUTCOMES:

Oncompletionofthecourse,thestudentswillbeableto

CO1: Explain existing and emerging deep learning architectures for text and speech processing

CO2: ApplydeeplearningtechniquesforNLPtasks,languagemodellingandmachinetranslation

CO3: Explain coreference and coherence for text processing

CO4: Buildquestion-answeringsystems,chatbotsanddialoguesystems

CO5: Applydeeplearningmodelsforbuildingspeechrecognitionandtext-to-speechsystems

TEXTBOOK

1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and SpeechRecognition”, Third Edition, 2022.

REFERENCES:

1. Dipanjan Sarkar, “Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data”, APress,2018.

2. Tanveer Siddiqui, Tiwary U S, “Natural Language Processing and Information Retrieval”,Oxford University Press, 2008.
3. LawrenceRabiner,Biing-HwangJuang,B.Yegnanarayana,“FundamentalsofSpeech Recognition” 1st Edition, Pearson, 2009.
4. Steven Bird, Ewan Klein, and Edward Loper, “Natural language processing withPython”, O’REILLY.

221AIDC55E BUSINESSANALYTICS L TP C
2023

COURSEOBJECTIVES:

- TounderstandtheAnalyticsLifeCycle.
- TocomprehendtheprocessofacquiringBusinessIntelligence
- TounderstandvarioustypesofanalyticsforBusinessForecasting
- TomodelthesupplychainmanagementforAnalytics.
- Toapplyanalyticsfordifferentfunctionsofabusiness

UNITI INTRODUCTIONTOBUSINESSANALYTICS 6

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNITII BUSINESSINTELLIGENCE 6

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNITIII BUSINESSFORECASTING 6

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modelling –Machine Learning for Predictive analytics.

UNITIV HR&SUPPLYCHAINANALYTICS 6

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain -Applying HR Analytics to make a prediction of the demand for hourly employeesfor a year.

UNITV MARKETING&SALESANALYTICS 6

Marketing Strategy, Marketing Mix, Customer Behaviour –selling Process – Sales Planning – Analytics applications in Marketing and Sales -predictive analytics for customers' behaviour in marketing and sales.

30PERIODS

LISTOF EXPERIMENTS:

UseMS-ExcelandPower-BItoperformthefollowing experimentsusingaBusinessdataset, and make presentations.

Studentsmaybeencouragedtobringtheirownreal-timesociallyrelevant dataset.

ICycle–MSExcel

1. ExplorethefeaturesofMs-Excel.
2. (i)Gettheinputfromuserandperformnumericaloperations(MAX,MIN,AVG,SUM, SQRT, ROUND)
ii)Performdataimport/exportoperationsfordifferentfileformats.
3. Performstatisticaloperations-Mean,Median,ModeandStandarddeviation,Variance, Skewness, Kurtosis
4. PerformZ-test,T-test&ANOVA
5. Performdatapre-processingoperationsi)HandlingMissingdataii)Normalization
6. PerformdimensionalityreductionoperationusingPCA,KPCA&SVD
7. Performbivariateandmultivariateanalysisonthedataset.
8. Applyandexplorevariousplottingfunctionsonthedata set.

IICycle–PowerBIDesktop

9. Explorethefeaturesof PowerBIDesktop
10. Prepare&Loaddata
11. Developthedatamodel
12. PerformDAXcalculations
13. Designareport
14. Createadashboardandperformdataanalysis
15. Presentationofacase study

COURSEOUTCOMES:

CO1: Explaintherealworldbusinessproblemsandmodelwithanalyticalsolutions.
CO2: IdentifythebusinessprocessesforextractingBusinessIntelligence
CO3: Applypredictiveanalyticsforbusinessfore-casting
CO4: Applyanalyticsforsupplychainandlogisticsmanagement
CO5: Useanalyticsformarketingandsales.

TEXTBOOKS

R.EvansJames,BusinessAnalytics,2ndEdition,Pearson,

221AIDC55F IMAGE AND VIDEO ANALYTICS L TP C
2 0 2 3

COURSEOBJECTIVES:

- Tounderstandthebasicsofimageprocessingtechniquesforcomputervision.
- Tolearnthetechniquesusedforimagepre-processing.
- Todiscussthevariousobjectdetectiontechniques.
- TounderstandthevariousObjectrecognitionmechanisms.
- Toelaborateonthevideoanalytics techniques.

UNITI INTRODUCTION 6

Computer Vision – Image representation and image analysis tasks - Image representations – digitization – properties – color images – Data structures for Image Analysis - Levels of image data representation - Traditional and Hierarchical image data structures.

UNITII IMAGEPRE-PROCESSING 6

Local pre-processing - Image smoothing - Edge detectors - Zero-crossings of the second derivative - Scale in image processing - Canny edge detection - Parametric edge models - Edges in multi-speralct images - Local pre-processing in the frequency domain - Line detection by local pre-processing operators - Image restoration.

UNITIII OBJECTDETECTIONUSINGMACHINELEARNING 6

Object detection– Object detection methods – Deep Learning framework for Object detection–

bounding box approach-Intersection over Union (IoU) –Deep Learning Architectures-R-CNN-Faster R-CNN-You Only Look Once(YOLO)-Salient features-Loss Functions-YOLO architectures

UNITIV FACERECOGNITIONANDGESTURERECOGNITION 6

Face Recognition-Introduction-Applications of Face Recognition-Process of Face Recognition-DeepFace solution by Facebook-FaceNet for Face Recognition- Implementation using FaceNet-Gesture Recognition.

UNITV VIDEO ANALYTICS6

Video Processing – use cases of video analytics-Vanishing Gradient and exploding gradient problem-RestNet architecture-RestNet and skip connections-Inception Network-GoogleNet architecture-Improvement in Inception v2-Video analytics-RestNet and Inception v3.

30 PERIODS

LISTOF EXERCISES 30PERIODS

1. WriteaprogramthatcomputestheT-pyramidofanimage.
2. Writeaprogramthatderivesthequadtreerepresentationof animageusingthe homogeneity criterion of equal intensity
3. Developprogramsforthefollowinggeometrictransforms:(a)Rotation(b)Changeofscale (c)Skewing(d)Affinetransformcalculatedfromthreepairsofcorrespondingpoints(e) Bilinear transform calculated from four pairs of corresponding points.
4. DevelopaprogramtoimplementObjectDetectionandRecognition
5. Developaprogramformotionanalysisusingmovingedges,andapplyittoyouri mage sequences.
6. DevelopaprogramforFacialDetectionandRecognition
7. Writeaprogramforeventdetectioninvideosurveillancesystem

TOTAL:60PERIODS

COURSEOUTCOMES:

Attheendofthiscourse,thestudentswillbeableto:

CO1: Understandthebasicsofimageprocessingtechniquesforcomputervisionandvideoanalysis.

CO2:Explainthetechniquesusedforimagepre-processing.

CO3:Developvariousobjectdetectiontechniques.

CO4: Understandthevariousfacerecognitionmechanisms.

CO5:Elaborateondeeplearning-basedvideoanalytics.

TEXTBOOK:

1. MilanSonka,VaclavHlavac,RogerBoyle,“ImageProcessing,Analysis,and Machine Vision”, 4nd edition, Thomson Learning, 2013.
2. VaibhavVerdhan,(2021,ComputerVisionUsingDeepLearningNeura lNetwork Architectures with Python and Keras,Apress 2021(UNIT-III,IV and V)

REFERENCES

1. RichardSzeliski,“ComputerVision:AlgorithmsandApplications”,SpringerVerla gLondon

2. Limited,2011.
3. CaifengShan,FatihPorikli,TaoXiang,ShaogangGong,“VideoAnalyticsforBusiness Intelligence”, Springer, 2012.
4. D.A.Forsyth,J.Ponce,“ComputerVision:AModernApproach”,PearsonEducation, 2003.
5. E.R.Davies,(2012),“Computer&MachineVision”,FourthEdition,AcademicPress.

221AIDC55G **COMPUTER VISION** **LTP C**

20 23

COURSEOBJECTIVES:

- TounderstandthefundamentalconceptsrelatedtoImageformationandprocessing.
- Tolearnfeaturedetection,matchinganddetection
- Tobecomefamiliarwithfeaturebasedalignmentandmotionestimation
- Todevelopskillson3Dreconstruction
- Tounderstandimagebasedrenderingandrecognition

UNITI INTRODUCTIONTOIMAGEFORMATIONANDPROCESSING 6

Computer Vision - Geometric primitives and transformations - Photometric image formation - The digital camera - Point operators - Linear filtering - More neighborhood operators - Fourier transforms - Pyramids and wavelets - Geometric transformations - Global optimization.

UNITII FEATUREDETECTION,MATCHINGANDSEGMENTATION 6

Points andpatches-Edges-Lines-Segmentation -Active contours-Split andmerge-Mean shift and mode finding - Normalized cuts - Graph cuts and energy-based methods.

UNIT III FEATURE-BASEDALIGNMENT&MOTIONESTIMATION 6

2D and 3D feature-based alignment - Pose estimation - Geometric intrinsic calibration - Triangulation - Two-frame structure from motion - Factorization - Bundle adjustment - Constrained structure and motion - Translational alignment - Parametric motion - Spline-based motion - Optical flow - Layered motion.

UNITIV 3DRECONSTRUCTION 6

Shape from X - Active rangefinding - Surface representations - Point-based representations- Volumetric representations - Model-based reconstruction - Recovering texture maps and albedosos.

UNITV IMAGE-BASEDRENDERINGANDRECOGNITION 6

View interpolation Layered depth images - Light fields and Lumigraphs - Environment mattes - Video-based rendering-Object detection - Face recognition - Instance recognition - Category recognition - Context and scene understanding- Recognition databases and test sets.

30 PERIODS

PRACTICALEXERCISES:
LABORATORYEXPERIMENTS:

Softwareneeded:

OpenCVcomputervisionLibraryforOpenCVinPython/PyCharmorC++/VisualStudiooror equivalent

- OpenCVInstallationandworkingwithPython
- BasicImageProcessing-loadingimages,Cropping,Resizing,Thresholding,Contour analysis, Bolb detection
- ImageAnnotation–Drawinglines,textcircle,rectangle,ellipseonimages
- ImageEnhancement-UnderstandingColorspaces,colorspaceconversion,Histogram equialization, Convolution, Image smoothing, Gradients, Edge Detection
- ImageFeaturesandImageAlignment –Imagetransforms–Fourier,Hough,ExtractORB Image features, Feature matching, cloning,Feature matching based image alignment
- ImagesegmentationusingGraphcut/Grabcut
- CameraCalibrationwithcirculargrid
- PoseEstimation
- 3DReconstruction–CreatingDepthmapfromstereoimages
- ObjectDetectionandTrackingusingKalmanFilter,Camshift

CO1: To understand basic knowledge, theories and methods in image processing and computervision.

CO2: ToimplementbasicandsomeadvancedimageprocessingtechniquesinOpenCV.

CO3: Toapply2Dafeature-basedbasedimagealignment,segmentationandmotionestimations.

CO4: Toapply3Dimagereconstructiontechniques

CO5: Todesignanddevelopinnovativeimageprocessingandcomputervisionapplications.

TEXTBOOKS:

1. RichardSzeliski,“ComputerVision:AlgorithmsandApplications”,Springer-Textsin Computer Science, Second Edition, 2022.

2. ComputerVision:AModernApproach, D.A.Forsyth,J.Ponce, Pearson Education, Second Edition, 2015.

REFERENCES:

1. RichardHartleyandAndrewZisserman,MultipleViewGeometryinComputerVision, Second Edition, Cambridge University Press, March 2004.

2. ChristopherM.Bishop;PatternRecognitionandMachineLearning,Springer,2006

3. E.R.Davies,ComputerandMachineVision,FourthEdition,AcademicPress,2012.

CO1: To understand basic knowledge, theories and methods in image processing and computervision.

CO2: ToimplementbasicandsomeadvancedimageprocessingtechniquesinOpenCV.

CO3: Toapply2Dafeature-basedbasedimagealignment,segmentationandmotionestimations.

CO4: Toapply3Dimagereconstructiontechniques

CO5: Todesignanddevelopinnovativeimageprocessingandcomputervisionapplications.

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3. RichardSzeliski,“ComputerVision:AlgorithmsandApplications”,Springer-Textsin Computer Science, Second Edition, 2022.

4. ComputerVision:AModernApproach,D.A.Forsyth,J.Ponce,PearsonEducation, Second Edition, 2015.

REFERENCES:

4. RichardHartleyandAndrewZisserman,MultipleViewGeometryinComputerVision, Second Edition, Cambridge University Press, March 2004.

5. ChristopherM.Bishop;PatternRecognitionandMachineLearning,Springer,2006

6. E.R.Davies,ComputerandMachineVision,FourthEdition,AcademicPress,2012.

221AIDC55H **BIGDATAANALYTICS** **LTPC**

202 3

OBJECTIVES:

- Tounderstandbig data.
- TolearnanduseNoSQLbigdata management.
- TolearnmapreduceanalyticsusingHadoopandrelatedtools.
- Toworkwithmapreduce applications
- TounderstandtheusageofHadooprelatedtoolsforBigDataAnalytics

UNITI UNDERSTANDINGBIGDATA 5

Introductiontobig data –convergenceofkeytrends –unstructureddata–industryexamplesof big data – web analytics – big data applications– big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNITII NOSQLDATAMANAGEMENT 7

Introduction to NoSQL – aggregate data models – key-value and document data models – relationships–graphdatabases–schemalessdatabases–materializedviews–distribution

models – master-slave replication – consistency - Cassandra – Cassandra data model – Cassandra examples – Cassandra clients

UNITIII MAPREDUCE APPLICATIONS 6

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

UNITIV BASICSOFHADOOP 6

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures - Cassandra – Hadoop integration.

UNIT V HADOOPRELATEDTOOLS 6

Hbase–datamodelandimplementations–Hbaseclients–Hbaseexamples–praxis. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts.
Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

30 PERIODS
COURSEOUTCOMES:
After the completion of this course, students will be able to:
CO1: Describebigdataandusecasesfromselectedbusinessdomains.
CO2: Explain NoSQL big data management.
CO3: Install,configure,andrunHadoopandHDFS.
CO4: Performmap-reduceanalyticsusingHadoop.
CO5: UseHadoop-relatedtoolssuchasHBase,Cassandra,Pig,andHiveforbigdataanalytics.

LISTOF EXPERIMENTS: 30 PERIODS

1. DownloadingandinstallingHadoop;UnderstandingdifferentHadoopmodes.Startup scripts, Configuration files.
2. HadoopImplementationoffilemanagementtasks,suchasAddingfilesanddirectories, retrieving files and Deleting files
3. ImplementofMatrixMultiplicationwithHadoopMapReduce
4. RunabasicWordCountMapReduceprogramtounderstandMapReduceParadigm.
5. InstallationofHivealongwithpracticeexamples.
7. InstallationofHBase,InstallingthriftalongwithPracticeexamples
8. Practiceimportingandexportingdatafromvariousdatabases.

SoftwareRequirements:
Cassandra,Hadoop,Java,Pig,HiveandHBase.

TEXTBOOKS:

TOTAL:60PERIODS

1. MichaelMinelli,MichelleChambers,andAmbigaDhiraj,"BigData,BigAnalytics : Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. EricSammer,"HadoopOperations",O'Reilley,2012.
3. Sadalage,PramodJ."NoSQLdistilled",2013

REFERENCES:

1. E.Capriolo,D.Wampler,andJ.Rutherglen,"ProgrammingHive",O'Reilley,2012.
2. LarsGeorge,"HBase:TheDefinitiveGuide",O'Reilley,2011.
3. EbenHewitt,"Cassandra:TheDefinitiveGuide",O'Reilley,2010.
4. AlanGates,"ProgrammingPig",O'Reilley,2011.

221AIDC56A CLOUDCOMPUTING LTP C
20 23

COURSEOBJECTIVES:

- Tounderstandtheprinciplesofcloudarchitecture,modelsandinfrastructure.
- Tounderstandtheconceptsofvirtualizationandvirtualmachines.
- TogainknowledgeaboutvirtualizationInfrastructure.
- ToexploreandexperimentwithvariousClouddeploymentenvironments.
- Tolearnaboutthesecurityissuesinthecloudenvironment.

UNITI CLOUDARCHITECTUREMODELSANDINFRASTRUCTURE 6

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges

UNITII VIRTUALIZATIONBASICS 6

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

UNITIII VIRTUALIZATIONINFRASTRUCTUREANDDOCKER 7

DesktopVirtualization –Network Virtualization –StorageVirtualization –System-levelof Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management –Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

UNITIV CLOUDDEPLOYMENTENVIRONMENT 6

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

UNITV CLOUDSECURITY 5

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Securityand Storage; Identityand Access Management (IAM) - IAMChallenges - IAMArchitecture and Practice.

PRACTICALEXERCISES: 30PERIODS

1. InstallVirtualbox/VMware/EquivalentopensourcecloudWorkstationwithdifferentflavours of Linux or Windows OS on top of windows 8 and above.

2. Install a C compiler in the virtual machine created using a virtual box and execute SimplePrograms

3. InstallGoogleAppEngine.Createahelloworldappandothersimplewebapplications using python/java.

4. UsetheGAElaunchertolaunchtheweb applications.

5. SimulateacloudscenariousingCloudSimandrunaschedulingalgorithmthatisnot present in CloudSim.

6. Findaproceduretotransferthefilesfromonevirtualmachinetoanothervirtualmachine.

7. InstallHadoopsinglenodeclusterandrunsimpleapplicationslikewordcount.

8. CreatingandExecutingYourFirstContainerUsingDocker.

9. RunaContainerfromDockerHub

COURSEOUTCOMES:

CO1: Understandthedesignchallengesinthecloud.

CO2: Applytheconceptofvirtualizationanditstypes.

CO3: ExperimentwithvirtualizationofhardwareresourcesandDocker.

CO4: Developanddeployservicesonthecloudandsetupacloud environment.

CO5: Explainsecuritychallengesinthecloudenvironment.

TOTAL:60PERIODS

TEXTBOOKS

1. KaiHwang,GeoffreyCFox,JackGDongarra,“DistributedandCloudComputing,From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.

2. JamesTurnbull,“TheDockerBook”,O’ReillyPublishers,2014.

3. Krutz,R.L.,Vines,R.D,“Cloudsecurity.AComprehensiveGuidetoSecureCloudComputing”, Wiley Publishing, 2010.

REFERENCES

1. JamesE.Smith,RaviNair,“VirtualMachines:VersatilePlatformsforSystemsand Processes”, Elsevier/Morgan Kaufmann, 2005.

2. TimMather,SubraKumaraswamy,andShahedLatif,“CloudSecurityandPrivacy:an enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009.

221AIDC56B APPDEVELOPMENT LTP C

202 3

COURSEOBJECTIVES:

- Tolearndevelopmentofnativeapplicationswithbasic GUIComponents
- Todevelopcross-platformapplicationswitheventhandling
- Todevelopapplicationswithlocationanddatastoragecapabilities
- Todevelopwebapplicationswithdatabaseaccess

UNITI FUNDAMENTALSOFMOBILE&WEBAPPLICATIONDEVELOPMENT 6

Basics of Web and Mobile application development, Native App, Hybrid App, Cross-platform App, What is Progressive Web App, Responsive Web design,

UNITII NATIVEAPPDEVELOPMENTUSING JAVA 6

Native Web App, Benefits of Native App, Scenarios to create Native App, Tools for creating Native App, Consof NativeApp, PopularNativeAppDevelopmentFrameworks,Java&Kotlinfor Android, Swift & Objective-C for iOS, Basics of React Native, Native Components, JSX, State, Props

UNITIII HYBRIDAPPDEVELOPMENT 6

HybridWebApp, Benefitsof HybridApp,CriteriaforcreatingNativeApp,Toolsforcreating Hybrid App, Cons of Hybrid App, Popular Hybrid App Development Frameworks, Ionic, Apache Cordova,

UNITIV CROSS-PLATFORMAPPDEVELOPMENTUSINGREACT-NATIVE 6

What is Cross-platform App, Benefits of Cross-platform App, Criteria for creating Cross-platform App, Tools for creating Cross-platform App, Cons of Cross-platform App, Popular Cross- platform App Development Frameworks, Flutter, Xamarin, React-Native, Basics of React Native, Native Components, JSX, State, Props

UNITV NON-FUNCTIONALCHARACTERISTICSOFAPPFRAMEWORKS 6

Comparisonof differentApp frameworks, Build Performance, App Performance, Debugging capabilities, Time to Market, Maintainability, Ease of Development, UI/UX, Reusability

30PERIODS

COURSEOUTCOMES:

CO1: DevelopNativeapplicationswithGUIComponents.

CO2: Develophybridapplicationswithbasiceventhandling.

CO3 Implementcross-platformapplicationswithlocationanddatastoragecapabilities.

CO4: ImplementcrossplatformapplicationswithbasicGUIandeventhandling.

CO5: Developwebapplicationswithclouddatabaseaccess.

PRACTICALEXERCISES: 30PERIODS

1. Usingreactnative,buildacrossplatformapplicationforaBMI calculator.
2. Buildacrossplatformapplicationforasimpleexpensemanagerwhichallowsentering expenses and income on each day and displays category wise weekly income and expense.
3. Develop a cross platform application toconvert unitsfrom imperial system tometric system(km to miles, kg to pounds etc.,)
4. Designanddevelopacrossplatformapplicationfordaytodaytask(to-do)management.
5. Design an android application using Cordova for a user login screen with username, password, reset button and a submit button. Also, include header image and a label. Use layout managers.

6. Designanddevelopanandroidapplicationusing ApacheCordovatofindanddisplaythecurre nt location of the user.
7. WriteprogramsusingJavatocreateAndroidapplicationhavingDatabases
- Forasimplelibraryapplication.
- Fordisplayingbooksavailable,bookslend,bookreservation.Assumethatstudent information is available in a database which has been stored in a database server.

TOTAL:60PERIODS

TEXTBOOKS

1. HeadFirstAndroidDevelopment,DawnGriffiths,O'Reilly,1st edition
2. ApacheCordovainAction,RaymondK.Camden,Manning.2015
3. Full Stack React Native: Create beautiful mobile apps with JavaScript and React Native, AnthonyAccomazzo,HousseinDjirdeh,SophiaShoemaker,DevinAbbott,FullStackpublishing

REFERENCES

1. AndroidProgrammingforBeginners,JohnHorton,PacktPublishing,2ndEdition
2. NativeMobileDevelopmentbyShaunLewis,Mike Dunn
3. BuildingCross-PlatformMobileandWebAppsforEngineersandScientists:AnActive Learning Approach, Pawan Lingras, Matt Triff, Rucha Lingras
4. ApacheCordova4Programming,JohnMWargo, 2015
5. ReactNativeCookbook,DanielWard,PacktPublishing,2ndEdition

221AIDC56C CLOUDSERVICESMANAGEMENT L TP C
2023

COURSEOBJECTIVES:

- IntroduceCloudServiceManagementterminology,definition&concepts
- CompareandcontrastcloudservicemanagementwithtraditionalITservicemanagement
- Identifystrategiestoreduceriskandeliminateissuesassociatedwithadoptionofclou d services

- Select appropriate structures for designing, deploying and running cloud-based services ina business environment
- Illustratethebenefitsanddrivetheadoptionofcloud-basedservicestosolverealworld problems

UNITI CLOUDSERVICEMANAGEMENTFUNDAMENTALS 6

Cloud Ecosystem, The Essential Characteristics, Basics of Information Technology Service ManagementandCloudServiceManagement,ServicePerspectives,CloudServiceModels,Cloud Service Deployment Models

UNITII CLOUDSERVICESSTRATEGY 6

Cloud Strategy Fundamentals, Cloud Strategy Management Framework, Cloud Policy, Key Driver for Adoption, Risk Management, IT Capacity and Utilization, Demand and Capacity matching, Demand Queueing, Change Management, Cloud Service Architecture

UNITIII CLOUDSERVICEMANAGEMENT 6

CloudServiceReferenceModel, CloudServiceLifeCycle, Basicsof CloudServiceDesign,Dealing with Legacy Systems and Services, Benchmarking of Cloud Services, Cloud Service Capacity Planning, Cloud Service Deployment and Migration, Cloud Marketplace, Cloud Service Operations Management

UNITIV CLOUDSERVICEECONOMICS 6

Pricing models for Cloud Services, Freemium, Pay Per Reservation, Pay per User, Subscription based Charging, Procurement of Cloud-based Services, Capex vs Opex Shift, Cloud service Charging, Cloud Cost Models

UNITV CLOUDSERVICEGOVERNANCE&VALUE 6

IT Governance Definition, Cloud Governance Definition, Cloud Governance Framework, Cloud Governance Structure, Cloud Governance Considerations, Cloud Service Model Risk Matrix, Understanding Value of Cloud Services, Measuring the value of Cloud Services, Balanced Scorecard, Total Cost of Ownership

COURSEOUTCOMES:

CO1: Exhibit cloud-design skills tobuild and automatebusinesssolutionsusing cloud technologies.

CO2: Possess Strong theoretical foundation leading to excellence and excitement towards adoption of cloud-based services

CO3: SolvetherealworldproblemsusingCloudservicesandtechnologies

PRACTICALEXERCISES:

30PERIODS

1. Create a Cloud Organization in AWS/Google Cloud/or any equivalent Open Source cloud softwares like Openstack, Eucalyptus, OpenNebula with Role-based access control
2. CreateaCost-modelforawebapplicationusingvariousservicesanddoCost-benefit analysis
3. CreatealertsforusageofCloudresources

4. CreateBillingalertsforyourCloudOrganization

5. CompareCloudcostforasimplewebapplicationacrossAWS,AzureandGCPand suggest the best one

TOTAL:60PERIODS

TEXTBOOKS

1. CloudServiceManagementandGovernance:SmartServiceManagementinCloud Eraby Enamul Haque, Enel Publications
2. CloudComputing:Concepts,Technology&ArchitecturebyThomasErl,Ricard oPuttini, Zaigham Mohammad 2013
3. CloudComputingDesignPatternsbyThomasErl,RobertCope,AminNaserpour

REFERENCES

1. EconomicsofCloudComputingbyPraveenAyyappa,LAPLambertAcademicPublishing
2. Mastering Cloud Computing Foundations and Applications Programming Rajkumar Buyya, Christian Vechhiola, S. Thamarai Selvi

221AIDC56D UIANDUXDESIGN LTP C
202 3

COURSEOBJECTIVES:

- ToprovideasoundknowledgeinUI&UX
- TounderstandtheneedforUIandUX
- TounderstandthevariousResearchMethodsusedinDesign
- ToexplorethevariousToolsusedinUI& UX
- Creatingawireframeandprototype

UNITI FOUNDATIONSOFDESIGN 6

UI vs. UX Design - Core Stages of Design Thinking - Divergent and Convergent Thinking - Brainstorming and Game storming - Observational Empathy

UNITII FOUNDATIONSOFUIDESIGN 6

Visual and UI Principles - UI Elements and Patterns - Interaction Behaviors and Principles – Branding - Style Guides

UNITIII FOUNDATIONSOFUXDESIGN 6

Introduction to User Experience - Why You Should Care about User Experience - Understanding User Experience - Defining the UX Design Process and its Methodology - Research in User Experience Design - Tools and Method used for Research - User Needs and its Goals - Know about Business Goals

UNITIV WIREFRAMING,PROTOTYPINGANDTESTING 6

Sketching Principles - Sketching Red Routes - Responsive Design – Wireframing - Creating Wireflows - Building a Prototype - Building High-Fidelity Mockups - Designing Efficiently with Tools- Interaction Patterns - Conducting Usability Tests - Other Evaluative User Research Methods - Synthesizing Test Findings - Prototype Iteration

UNITVRESEARCH,DESIGNING,IDEATING,&INFORMATION ARCHITECTURE6

Identifying andWriting Problem Statements - Identifying Appropriate Research Methods - Creating Personas - Solution Ideation - Creating User Stories - Creating Scenarios - Flow Diagrams - Flow Mapping - Information Architecture

LISTOF EXPERIMENTS 30PERIODS

1. DesigningaResponsivelayoutforansocietalapplication
2. ExploringvariousUIInteractionPatterns
3. DevelopinganinterfacewithproperUIStyleGuides
4. DevelopingWireflowdiagramforapplicationusingopensourcesoftware
5. ExploringvariousopensourcecollaborativeinterfacePlatform
6. HandsonDesignThinkingProcessforanewproduct
7. Brainstormingfeatureforproposedproduct
8. DefiningtheLookandFeelofthenewProject
9. CreateaSamplePatternLibraryforthatproduct(Moodboard,Fonts,ColorsbasedonUI principles)
10. Identifyacustomerproblemtosolve
11. Conduct end-to-end user research - User research, creating personas, Ideation process(User stories, Scenarios), Flow diagrams, Flow Mapping
12. Sketch,designwithpopulartoolandbuildaprototypeandperformusabilitytestingan d identify improvements

TOTAL:60PERIODS

COURSEOUTCOMES:

Oncompletionofthecourse,thestudentswillbeableto:

CO1: BuildUIforuser Applications

CO2: EvaluateUXdesignofanyproductorapplication

CO3: Demonstrate UX Skills in product development

CO4: Implement Sketching principles

CO5: CreateWireframeandPrototype

TEXTBOOKS

1. JoelMarsh,“UXforBeginners”,O’Reilly,2022
2. Jon Yablonski, “Laws of UX using Psychology to Design Better Product & Services” O’Reilly 2021

REFERENCES

1. JeniferTidwell,CharlesBrewer,AynneValencia,“DesigningInterface”3 rdEdition ,O’Reilly 2020
2. SteveSchoger,AdamWathan“RefactoringUI”,2018
3. SteveKrug,“Don'tMakeMeThink,Revisited:ACommonsenseApproachtoWeb& Mobile”, Third Edition, 2015
4. https://www.nngroup.com/articles/
5. https://www.interaction-design.org/literature.

221AIDC56E **SOFTWARE TESTING AND AUTOMATION** **LTPC 20 23**

COURSEOBJECTIVES:

- Tounderstandthebasicsofsoftwaretesting
- Tolearnhowtodothetestingandplanning effectively
- Tobuildtestcasesandexecutethem
- Tofocusonwideaspectsoftestingandunderstandingmultiplefacetsof testing
- Togetaninsightabouttestautomationandthetoolsusedfortestautomation

UNITI **FOUNDATIONSOFSOFTWARETESTING** **6**

WhydowetestSoftware?,Black-BoxTestingandWhite-BoxTesting,SoftwareTestingLifeCycle, V-model of Software Testing, Program Correctness and Verification, Reliability versus Safety, Failures, Errors and Faults (Defects), Software Testing Principles, Program Inspections, Stages of Testing: Unit Testing, Integration Testing, System Testing

UNITII **TESTPLANNING** **6**

TheGoalofTestPlanning,HighLevelExpectations,IntergroupResponsibilities,TestPhases,Test Strategy, Resource Requirements, Tester Assignments, Test Schedule, Test Cases, Bug Reporting, Metrics and Statistics.

UNITIII **TESTDESIGNANDEXECUTION** **6**

Test Objective Identification, Test Design Factors, Requirement identification, Testable Requirements, Modeling a Test Design Process, Modeling Test Results, Boundary Value Testing, Equivalence Class Testing, Path Testing, Data Flow Testing, Test Design Preparedness Metrics, Test Case Design Effectiveness, Model-Driven Test Design, Test Procedures, Test Case Organization and Tracking, Bug Reporting, Bug Life Cycle.

UNITIV **ADVANCEDTESTINGCONCEPTS** **6**

Performance Testing: Load Testing, Stress Testing, Volume Testing, Fail-Over Testing, Recovery Testing, Configuration Testing, Compatibility Testing, Usability Testing, Testing theDocumentation, Security testing, Testing in the Agile Environment, Testing Web and Mobile Applications.

UNITV **TESTAUTOMATIONANDTOOLS** **6**

Automated Software Testing,Automate Testing of Web Applications, Selenium: Introducing Web DriverandWebElements,LocatingWebElements,ActionsonWebElements,DifferentWeb

Drivers, Understanding Web Driver Events, Testing: Understanding Testing.xml, Adding Classes, Packages, Methods to Test, Test Reports.

PRACTICALEXERCISES: **30PERIODS**

1. Developthetestplanfortestingane-commerceweb/mobileapplication(www.amazon.in).
2. Designthetestcasesfortestingthee-commerceapplication
3. Testthee-commerceapplicationandreportthedefectsinit.
4. Developthetestplananddesignthetestcasesforaninventorycontrolsystem.

5. Executethetestcasesagainstaclientserverordesktopapplicationandidentifythedefects.
6. Testtheperformanceofthee-commerceapplication.
7. Automatethetestingofe-commerceapplicationsusingSelenium.
8. IntegrateTestNGwiththeabovetestautomation.
9. MiniProject:

a) Buildadata-drivenframeworkusingSeleniumandTestNG
b) BuildPageobjectModelusingSeleniumandTestNG
c) BuildBDDframeworkwithSelenium,TestNGandCucumber

COURSEOUTCOMES:

CO1: Understandthebasicconceptsofsoftwaretestingandtheneedforsoftwaretesting
CO2:DesignTestplanninganddifferentactivitiesinvolvedintestplanning
CO3:Designeffectivetestcasesthatcanuncovercriticaldefectsintheapplication
CO4:Carryoutadvancedtypesoftesting
CO5: AutomatethesoftwaretestingusingSeleniumandTestNG

TOTAL:60PERIODS

TEXTBOOKS

1. YogeshSingh,“SoftwareTesting”,CambridgeUniversityPress,2012
2. Unmesh Gundecha,SatyaAvasarala,"Selenium WebDriver3Practical Guide"-Second Edition 2018

REFERENCES

1. GlenfordJ. Myers, CoreySandler,TomBadgett,TheArtof SoftwareTesting, 3rdEdition, 2012, John Wiley & Sons, Inc.
2. RonPatton,Softwaretesting,2ndEdition,2006,SamsPublishing
3. PaulC.Jorgensen,SoftwareTesting:ACraftsman’sApproach,FourthEdition,2014, Taylor & Francis Group.
4. CarlCocchiaro,SeleniumFrameworkDesigninData-DrivenTesting,2018,PacktPublishing.
5. ElfriedeDustin,ThomGarrett,BernieGaurf,ImplementingAutomatedSoftwareTesting, 2009, Pearson Education, Inc.
6. SatyaAvasarala,SeleniumWebDriverPracticalGuide,2014,PacktPublishing.
7. VarunMenon,TestNgBeginner'sGuide,2013,PacktPublishing.

221AIDC56F WEBAPPLICATIONSECURITY LTP C
202 3

COURSEOBJECTIVES:

- Tounderstandthefundamentalsofwebapplicationsecurity
- Tofocusonwideaspectsofsecuredevelopmentanddeploymentofwebapplications
- TolearnhowtobuildsecureAPIs
- Tolearnthebasicsofvulnerabilityassessmentandpenetrationtesting
- TogetaninsightaboutHackingtechniquesandTools

UNITI FUNDAMENTALSOFWEBAPPLICATIONSECURITY 6

The history of Software Security-Recognizing Web Application Security Threats, Web Application Security, Authenticationand Authorization, Secure Socket layer,Transport layer Security, Session Management-Input Validation

UNITII SECUREDEVELOPMENTANDDEPLOYMENT 5

Web Applications Security - Security Testing, Security Incident Response Planning,The Microsoft Security Development Lifecycle (SDL), OWASP Comprehensive Lightweight Application Security Process (CLASP), The Software Assurance Maturity Model (SAMM)

UNITIII SECUREAPIDEVELOPMENT 6

API Security- Session Cookies,Token Based Authentication, Securing Natter APIs: Addressing threats with Security Controls, Rate Limiting for Availability, Encryption, Audit logging, Securing service-to-service APIs: API Keys , OAuth2, Securing Microservice APIs: Service Mesh, Locking Down Network Connections, Securing Incoming Requests.

UNITIV VULNERABILITYASSESSMENTANDPENETRATIONTESTING 6

Vulnerability Assessment Lifecycle, Vulnerability Assessment Tools: Cloud-based vulnerability scanners, Host-based vulnerability scanners, Network-based vulnerability scanners, Database-based vulnerability scanners, Types of Penetration Tests: External Testing, Web Application Testing, Internal Penetration Testing, SSID or Wireless Testing, Mobile Application Testing.

UNITV HACKINGTECHNIQUESANDTOOLS 7

Social Engineering, Injection, Cross-Site Scripting(XSS), Broken Authentication and Session Management, Cross-Site Request Forgery, Security Misconfiguration, Insecure Cryptographic Storage, Failure to Restrict URL Access, Tools: Comodo, OpenVAS, Nexpose, Nikto, Burp Suite, etc.

PRACTICALEXERCISES:

30PERIOD

S

1. Installwiresharkandexplorethevariousprotocols
a. AnalyzethedifferencebetweenHTTPvsHTTPS
b. Analyzethevarioussecuritymechanismsembeddedwithdifferentprotocols.
2. IdentifythevulnerabilitiesusingOWASPZAPtool
3. CreatesimpleRESTAPIusingpythonforfollowingoperation
. GET
a. PUSH
b. POST
c. DELETE
4. InstallBurpSuitetodofollowingvulnerabilities:
. SQLinjection
a. cross-sitescripting(XSS)
5. AttackthewebsiteusingSocialEngineeringmethod

COURSEOUTCOMES:

CO1: Understandingthebasicconceptsofwebapplicationsecurityandtheneedfor it

CO2: Beacquaintedwiththeprocessforsecuredevelopmentanddeploymentofwebapplications

CO3: AcquiretheskilltodesignanddevelopSecureWebApplicationsthatuseSecureAPIs

CO4:Beabletogettheimportanceofcarryingoutvulnerabilityassessmentandpenetration testing

CO5:Acquiretheskilltothinklikeahackerandtousehackerstoolsets

TOTAL:60PERIODS

TEXTBOOKS

1. AndrewHoffman, WebApplicationSecurity:ExploitationandCountermeasuresforModern Web Applications, First Edition, 2020, O'Reilly Media, Inc.
2. BryanSullivan,VincentLiu,WebApplicationSecurity:ABeginnersGuide,2012,The McGraw-Hill Companies.
3. NeilMadden,APISecurityinAction,2020,ManningPublicationsCo.,NY,USA.

REFERENCES

1. Michael Cross, Developer's GuidetoWebApplication Security, 2007, Syngress Publishing, Inc.
2. RaviDasandGregJohnson,TestingandSecuringWebApplications,2021,Taylor& Francis Group, LLC.
3. PrabathSiriwardena,AdvancedAPISecurity,2020,ApressMediaLLC,USA.
4. MalcomMcDonald,WebSecurityforDevelopers,2020,NoStarchPress, Inc.
5. Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, Gideon Lenkey, and Terron Williams Grey Hat Hacking: The Ethical Hacker's Handbook, Third Edition, 2011, The McGraw-Hill Companies.

221AIDC56G	**DEVOPS**	**LTP C**

202 3

COURSEOBJECTIVES:

- TointroduceDevOpsterminology,definition&concepts
- TounderstandthedifferentVersioncontroltoolslikeGit,Mercurial
- TounderstandtheconceptsofContinuousIntegration/ContinuousTesting/Continuous Deployment)
- TounderstandConfigurationmanagementusingAnsible
- Illustratethebenefitsanddrivetheadoptionofcloud-basedDevopstoolstosolvereal world problems

UNITI INTRODUCTIONTODEVOPS 6

DevopsEssentials-IntroductionToAWS,GCP,Azure-Versioncontrolsystems:GitandGithub.

UNITII COMPILEANDBUILDUSINGMAVEN&GRADLE 6

Introduction, Installation of Maven, POM files, Maven Build lifecycle, Build phases(compile build, test, package) Maven Profiles, Maven repositories(local, central, global),Maven plugins, Maven create and build Artificats, Dependency management, Installation of Gradle, Understand buildusing Gradle

UNITIII CONTINUOUSINTEGRATIONUSINGJENKINS 6

Install & Configure Jenkins, Jenkins Architecture Overview, Creating a Jenkins Job, Configuring a Jenkins job, Introduction to Plugins, Adding Plugins to Jenkins, Commonly used plugins (GitPlugin, Parameter Plugin, HTML Publisher, Copy Artifact and Extended choice parameters). Configuring Jenkins to work with java, Git and Maven, Creating a Jenkins Build and Jenkins workspace.

UNITIV CONFIGURATIONMANAGEMENTUSINGANSIBLE 6

Ansible Introduction, Installation, Ansible master/slave configuration, YAML basics, Ansible modules, Ansible Inventory files, Ansible playbooks, Ansible Roles, adhoc commands in ansible

UNITV BUILDINGDEVOPSPIPELINESUSINGAZURE 6

Create Github Account, Create Repository, Create Azure Organization,Create a new pipeline, Build a sample code, Modify azure-pipelines.yaml file

30 PERIODS

COURSEOUTCOMES:

CO1: UnderstanddifferentactionsperformedthroughVersioncontroltoolslikeGit.

CO2: PerformContinuousIntegrationandContinuousTestingandContinuousDeployment using Jenkins by building and automating test cases using Maven & Gradle.

CO3:AbilitytoPerformAutomatedContinuousDeployment

CO4: AbilitytodoconfigurationmanagementusingAnsible

CO5: UnderstandtoleverageCloud-basedDevOpstoolsusingAzureDevOps

PRACTICALEXERCISES: **30PERIODS**

1. CreateMavenBuildpipelineinAzure
2. RunregressiontestsusingMavenBuildpipelineinAzure
3. InstallJenkinsin Cloud
4. CreateCIpipelineusingJenkins
5. CreateaCDpipelineinJenkinsanddeployinCloud
6. CreateanAnsibleplaybookforasimplewebapplicationinfrastructure
7. BuildasimpleapplicationusingGradle
8. InstallAnsibleandconfigureansiblerolesandtowriteplaybooks

TEXTBOOKS

1. Roberto Vormittag, “A Practical Guide to Git and GitHub forWindows Users: From Beginner to Expert in Easy Step-By-Step Exercises”, Second Edition, Kindle Edition, 2016.
2. Jason Cannon, “Linux for Beginners: An Introduction to the Linux Operating System and Command Line”, Kindle Edition, 2014

REFERENCES

1. Hands-On Azure Devops: Cicd Implementation For Mobile, Hybrid, And Web Applications Using Azure Devops And Microsoft Azure: CICD Implementation for ... DevOps and Microsoft Azure (English Edition) Paperback – 1 January 2020
2. byMitesh Soni
3. Jeff Geerling, “Ansible for DevOps: Server and configuration management for humans”, First Edition, 2015.

4. David Johnson, “Ansible for DevOps: Everything You Need to Know to Use Ansible for DevOps”, Second Edition, 2016.
5. Mariot Tsitoara, “Ansible 6. Beginning Git and GitHub: A Comprehensive Guide to Version Control, Project Management, and Teamwork for the New Developer”, Second Edition, 2019.
6. https://www.jenkins.io/user-handbook.pdf
7. https://maven.apache.org/guides/getting-started/

221AIDC56H PRINCIPLESOFPROGRAMMINGLANGUAGES LTP C 300 3

COURSEOBJECTIVES:

- Tounderstandanddescribesyntaxandsemanticsofprogramminglanguages
- Tounderstanddata,datatypes,andbasicstatements
- Tounderstandcall-returnarchitectureandwaysofimplementingthem
- Tounderstandobject-orientation,concurrency,andeventhandlinginprogramming languages
- Todevelopprogramsinnon-proceduralprogrammingparadigms

UNITI SYNTAXANDSEMANTICS 9

Evolution of programming languages – describing syntax – context-free grammars – attribute grammars – describing semantics – lexical analysis – parsing – recursive-descent – bottom up parsing

UNITII DATA,DATATYPES,ANDBASICSTATEMENTS 9

Names – variables – binding – type checking – scope – scope rules – lifetime and garbage collection–primitivedatatypes–strings–arraytypes–associativearrays–recordtypes– uniontypes–pointersandreferences–Arithmeticexpressions–overloadedoperators– type conversions– relational and boolean expressions– assignment statements– mixed mode assignments– control structures– selection– iterations– branching– guarded statements

UNITIII SUBPROGRAMSANDIMPLEMENTATIONS 9

Subprograms–designissues–localreferencing–parameterpassing–overloadedmethods– generic methods – design issues for functions– semantics of call and return – implementingsimplesubprograms–stackanddynamiclocalvariables–nested subprograms – blocks – dynamic scoping

UNITIV OBJECT-ORIENTATION,CONCURRENCY,ANDEVENTHANDLING 9

Object-orientation– design issues for OOP languages– implementation of object-oriented constructs–concurrency–semaphores–monitors–messagepassing–threads– statement level concurrency – exception handling – event handling

UNITV FUNCTIONALANDLOGICPROGRAMMINGLANGUAGES 9

Introduction to lambda calculus – fundamentals of functional programming languages –

ProgrammingwithScheme–ProgrammingwithML–Introductiontologicandlogic programming – Programming with Prolog – multi-paradigm languages

TOTAL:45 PERIODS

COURSEOUTCOMES:

CO1: Describesyntaxandsemanticsofprogramminglanguages

CO2: Explaindata,datatypes,andbasicstatementsofprogramminglanguages

CO3: Designandimplementsubprogramconstructs

CO4: Applyobject-oriented,concurrency,andeventhandlingprogrammingconstructs and Develop programs in Scheme, ML, and Prolog

CO5: Understandandadoptnewprogramminglanguages

TEXTBOOKS

1. RobertW.Sebesta,“ConceptsofProgrammingLanguages”,TwelfthEdition(Global Edition), Pearson, 2022.

2. MichaelL.Scott,“ProgrammingLanguagePragmatics”,FourthEdition,Elsevier,2018.

3. R.KentDybvig,“TheSchemeprogramminglanguage”,FourthEdition,PrenticeHall,2011.

4. JeffreyD.Ullman,“ElementsofMLprogramming”,SecondEdition,Pearson,1997.

5. W. F. Clocksin and C. S. Mellish, “Programming in Prolog: Using the ISO Standard”, Fifth Edition, Springer, 2003.

221AIDC63A Cloud Computing 2 0 2 3

COURSEOBJECTIVES:

- Tounderstandtheprinciplesofcloudarchitecture,modelsandinfrastructure.
- Tounderstandtheconceptsofvirtualizationandvirtualmachines.
- TogainknowledgeaboutvirtualizationInfrastructure.
- ToexploreandexperimentwithvariousClouddeploymentenvironments.
- Tolearnaboutthesecurityissuesinthecloudenvironment.

UNITI CLOUDARCHITECTUREMODELSANDINFRASTRUCTURE 6

Cloud Architecture: System Models for Distributed and Cloud Computing – NIST Cloud Computing Reference Architecture – Cloud deployment models – Cloud service models; Cloud Infrastructure: Architectural Design of Compute and Storage Clouds – Design Challenges

UNITII VIRTUALIZATIONBASICS 6

Virtual Machine Basics – Taxonomy of Virtual Machines – Hypervisor – Key Concepts – Virtualization structure – Implementation levels of virtualization – Virtualization Types: Full Virtualization – Para Virtualization – Hardware Virtualization – Virtualization of CPU, Memory and I/O devices.

UNITIII VIRTUALIZATIONINFRASTRUCTUREANDDOCKER 7

DesktopVirtualization –Network Virtualization –StorageVirtualization –System-levelof Operating Virtualization – Application Virtualization – Virtual clusters and Resource Management –Containers vs. Virtual Machines – Introduction to Docker – Docker Components – Docker Container – Docker Images and Repositories.

UNITIV CLOUDDEPLOYMENTENVIRONMENT 6

Google App Engine – Amazon AWS – Microsoft Azure; Cloud Software Environments – Eucalyptus – OpenStack.

UNITV CLOUDSECURITY 5

Virtualization System-Specific Attacks: Guest hopping – VM migration attack – hyperjacking. Data Securityand Storage; Identityand Access Management (IAM) - IAMChallenges - IAMArchitecture and Practice.

30 PERIODS

PRACTICALEXERCISES: 30PERIODS

1. InstallVirtualbox/VMware/EquivalentopensourcecloudWorkstationwithdifferentflavours of Linux or Windows OS on top of windows 8 and above.
2. Install a C compiler in the virtual machine created using a virtual box and execute SimplePrograms
3. InstallGoogleAppEngine.Createahelloworldappandothersimplewebapplications using python/java.
4. UsetheGAElaunchertolaunchtheweb applications.
5. SimulateacloudscenariousingCloudSimandrunaschedulingalgorithmthatisnot present in CloudSim.
6. Findaproceduretotransferthefilesfromonevirtualmachinetoanothervirtualmachine.
7. InstallHadoopsinglenodeclusterandrunsimpleapplicationslikewordcount.
8. CreatingandExecutingYourFirstContainerUsingDocker.
9. RunaContainerfromDockerHub

COURSEOUTCOMES:

CO1: Understandthedesignchallengesinthecloud.

CO2: Applytheconceptofvirtualizationanditstypes.

CO3: ExperimentwithvirtualizationofhardwareresourcesandDocker.

CO4: Developanddeployservicesonthecloudandsetupacloud environment.

CO5: Explainsecuritychallengesinthecloudenvironment.

TOTAL:60PERIODS

TEXTBOOKS

1. KaiHwang,GeoffreyCFox,JackGDongarra,“DistributedandCloudComputing,From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2. JamesTurnbull,“TheDockerBook”,O’ReillyPublishers,2014.
3. Krutz,R.L.,Vines,R.D,“Cloudsecurity.AComprehensiveGuidetoSecureCloudComputing”, Wiley Publishing, 2010.

REFERENCES

1. JamesE.Smith,RaviNair,“VirtualMachines:VersatilePlatformsforSystemsand Processes”, Elsevier/Morgan Kaufmann, 2005.
2. TimMather,SubraKumaraswamy,andShahedLatif,“CloudSecurityandPrivacy:a n enterprise perspective on risks and compliance”, O’Reilly Media, Inc., 2009.

221AIDC63B	**Virtualization**	**2 0 2 3**

COURSEOBJECTIVES:

- ToLearnthebasicsandtypesofVirtualization
- TounderstandtheHypervisorsanditstypes
- ToExploretheVirtualizationSolutions
- ToExperimentthevirtualizationplatforms

UNITI INTRODUCTIONTOVIRTUALIZATION 7

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations- Types of hardware virtualization: Full virtualization - partial virtualization - Paravirtualization-Types of Hypervisors

UNITII SERVERANDDESKTOPVIRTUALIZATION 6

Virtual machine basics- Types of virtual machines- Understanding Server Virtualization- types of server virtualization- Business Cases for Server Virtualization – Uses of Virtual Server Consolidation – Selecting Server Virtualization Platform-Desktop Virtualization-Types of Desktop Virtualization

UNITIII NETWORKVIRTUALIZATION 6

Introduction to Network Virtualization-Advantages- Functions-Tools for Network Virtualization-VLAN-WAN Architecture-WAN Virtualization

UNITIV STORAGEVIRTUALIZATION 5

Memory Virtualization-Types of Storage Virtualization-Block, File-Addressspace Remapping-Risks of Storage Virtualization-SAN-NAS-RAID

UNITV VIRTUALIZATIONTOOLS 6

VMWare-Amazon AWS-Microsoft HyperV- Oracle VM Virtual Box- IBM PowerVM- Google Virtualization- Case study.

30 PERIODS

PACTICALEXERCISES:

1. Createtype2virtualizationinVMWAREoranyequivalent OpenSourceTool.Allocatememory and storage space as per requirement. Install Guest OS on that VMWARE.

2.
   a. Shrinkandextendvirtualdisk
   b. Create,Manage,Configureandschedulesnapshots
   c. CreateSpanned,MirroredandStripedvolume
   d. CreateRAID5volume
3.
   a. DesktopVirtualizationusingVNC
   b. DesktopVirtualizationusingChromeRemoteDesktop

22AIDC64A ETHICALHACKING LTP C

20 23

COURSEOBJECTIVES:

- Tounderstandthebasicsofcomputerbasedvulnerabilities.
- Toexploredifferentfootprinting,reconnaissanceandscanningmethods.
- Toexposetheenumerationandvulnerabilityanalysismethods.
- TounderstandhackingoptionsavailableinWebandwirelessapplications.
- Toexploretheoptionsfornetworkprotection.
- Topracticetoolstoperformethicalhackingtoexpose thevulnerabilities.

UNITI INTRODUCTION 6

Ethical Hacking Overview - Role of Security and Penetration Testers .- Penetration-Testing Methodologies- Laws of the Land - Overview of TCP/IP- The Application Layer -The Transport Layer- TheInternetLayer -IPAddressing .- Network andComputerAttacks- Malware- Protecting Against Malware Attacks.- Intruder Attacks - Addressing Physical Security

UNITII FOOTPRINTING,RECONNAISSANCEANDSCANNINGNETWORKS 6

Footprinting Concepts - Footprinting through Search Engines, Web Services, Social Networking Sites, Website, Email - Competitive Intelligence - Footprinting through Social Engineering - Footprinting Tools - Network Scanning Concepts - Port-Scanning Tools - Scanning Techniques - Scanning Beyond IDS and Firewall

UNITIII ENUMERATIONANDVULNERABILITYANALYSIS 6

Enumeration Concepts - NetBIOS Enumeration – SNMP,LDAP, NTP, SMTP and DNS Enumeration - Vulnerability Assessment Concepts - Desktop and Server OS Vulnerabilities - Windows OS Vulnerabilities - Tools for Identifying Vulnerabilities in Windows- Linux OS Vulnerabilities- Vulnerabilities of Embedded Oss

UNITIV SYSTEMHACKING 6

Hacking Web Servers - Web Application Components- Vulnerabilities - Tools for Web Attackers and Security Testers Hacking Wireless Networks - Components of a Wireless Network – Wardriving- Wireless Hacking - Tools of the Trade –

UNITV NETWORKPROTECTIONSYSTEMS 6

Access Control Lists. - Cisco Adaptive Security Appliance Firewall - Configuration and Risk Analysis Tools for Firewalls and Routers - Intrusion Detection and Prevention Systems- Network-Based and Host-Based IDSs and IPSs - Web Filtering - Security Incident Response Teams – Honeypots.

30 PERIODS

PRACTICALEXERCISES:

1. InstallKaliorBacktrackLinux/Metasploitable/WindowsXP
2. Practicethebasicsof reconnaissance.
3. UsingFOCA/SearchDiggitytools extractmetadataandexpandingthetargetlist

4.Aggregatesinformationfrompublicdatabasesusingonlinefreetoolslike Paterva's Maltego.
5.InformationgatheringusingtoolslikeRobtex.
6. ScanthetargetusingtoolslikeNessus.
7. ViewandcapturenetworktrafficusingWireshark.
8. AutomatedigforvulnerabilitiesandmatchexploitsusingArmitage

FOCA : http://www.informatica64.com/foca.aspx.
Nessus
:http://www.tenable.com/products/ness
us.Wireshark : http://www.wireshark.org.

TOTAL:60PERIODS

COURSEOUTCOMES:

Attheendofthiscourse,thestudentswillbeable:

CO1:Toexpressknowledgeonbasicsofcomputerbasedvulnerabilities

CO2:Togainunderstandingondifferentfootprinting,reconnaissanceandscanningmethods.

CO3 Todemonstratetheenumerationandvulnerabilityanalysismethods

CO4:TogainknowledgeonhackingoptionsavailableinWebandwirelessapplications.

CO5:Toacquireknowledgeontheoptionsfornetwork protection.

CO6:Tousetoolstoperformethicalhackingtoexposethevulnerabilities.

TEXTBOOKS

1. MichaelT.Simpson,KentBackman,andJamesE.Corley,Hands-OnEthicalHackingand Network Defense, Course Technology, Delmar Cengage Learning, 2010.
2. TheBasicsofHackingandPenetrationTesting-PatrickEngebretson,SYNGRESS, Elsevier, 2013.
3. TheWebApplicationHacker'sHandbook:FindingandExploitingSecurityFlaws,DafyddStuttard and Marcus Pinto, 2011.

REFERENCES

1. BlackHatPython:PythonProgrammingforHackersandPentesters,JustinSeitz, 2014.

22AIDC64B **DIGITALANDMOBILEFORENSICS** **L TPC**
202 3

COURSEOBJECTIVES:

- Tounderstandbasicdigitalforensicsandtechniques.
- Tounderstanddigitalcrimeandinvestigation.
- Tounderstandhowtobepreparedfordigitalforensic readiness.
- TounderstandanduseforensicstoolsforiOSdevices.
- TounderstandanduseforensicstoolsforAndroiddevices.

UNITI **INTRODUCTIONTODIGITALFORENSICS** **6**

Forensic Science – Digital Forensics – Digital Evidence – The Digital Forensics Process – Introduction – The Identification Phase – The Collection Phase – The Examination Phase – The Analysis Phase – The Presentation Phase

UNITII **DIGITALCRIMEANDINVESTIGATION** **6**

DigitalCrime–Substantive CriminalLaw–GeneralConditions –Offenses–InvestigationMethods for Collecting Digital Evidence – International Cooperation to Collect Digital Evidence

UNITIII **DIGITALFORENSICREADINESS** **6**

Introduction – Law Enforcement versus Enterprise Digital Forensic Readiness – Rationale for Digital Forensic Readiness – Frameworks, Standards and Methodologies – Enterprise Digital Forensic Readiness – Challenges in Digital Forensics

UNITIV **iOSFORENSICS** **6**

Mobile Hardware and Operating Systems - iOS Fundamentals – Jailbreaking – File System – Hardware – iPhone Security – iOS Forensics – Procedures and Processes – Tools – Oxygen Forensics – MobilEdit – iCloud

UNITV **ANDROIDFORENSICS** **6**

Android basics – Key Codes – ADB – Rooting Android – Boot Process – File Systems – Security – Tools – Android Forensics – Forensic Procedures – ADB – Android OnlyTools – Dual UseTools – Oxygen Forensics – MobilEdit – Android App Decompiling

30 PERIODS

COURSEOUTCOMES:

Oncompletionofthecourse,thestudentswillbeableto:

CO1:Haveknowledgeondigitalforensics.

CO2: Knowaboutdigitalcrimeandinvestigations.

CO3: Beforensicready.

CO4:Investigate,identifyandextractdigitalevidencefromiOSdevices.

CO5: Investigate,identifyandextractdigitalevidencefromAndroiddevices.

LABEXPERIMENTS: **30PERIODS**

1. InstallationofSleuthKitonLinux.Listalldatablocks.Analyzeallocatedaswellasunallocated blocks of a disk image.
2. DataextractionfromcalllogsusingSleuth Kit.
3. DataextractionfromSMSandcontactsusingSleuth Kit.
4. InstallMobileVerificationToolkitorMVTanddecryptencryptediOSbackups.
5. ProcessandparserecordsfromtheiOSsystem.
6. ExtractinstalledapplicationsfromAndroiddevices.
7. ExtractdiagnosticinformationfromAndroiddevicesthroughtheadbprotocol.
8. Generateaunifiedchronologicaltimelineofextractedrecords,

TOTAL:60PERIODS

TEXTBOOK:

1. AndreArnes,“DigitalForensics”,Wiley,2018.
2. ChuckEasttom,“AnIn-depthGuidetoMobileDeviceForensics”,FirstEdition,CRCPress, 2022.

REFERENCES

1. Vacca,J,ComputerForensics,ComputerCrimeSceneInvestigation,2ndEd,Charles River Media, 2005, ISBN: 1-58450-389.

22AIDC64C	SOCIALNETWORKSECURITY	LTP C
		202 3

COURSEOBJECTIVES:

- Todevelopsemanticwebrelatedsimpleapplications
- ToexplainPrivacyandSecurityissuesinSocialNetworking
- Toexplainthedataextractionandminingofsocialnetworks
- Todiscussthepredictionofhumanbehaviorinsocialcommunities
- TodescribetheAccessControl,PrivacyandSecuritymanagementofsocialnetworks

UNITI FUNDAMENTALSOFSOCIALNETWORKING 6

IntroductiontoSemanticWeb,Limitationsof currentWeb,Development ofSemanticWeb, Emergence of the Social Web, Social Network analysis, Development of Social Network Analysis,Keyconceptsandmeasuresinnetworkanalysis,Historicaloverviewofprivacyand security, Major paradigms, for understanding privacy and security

UNITII SECURITYISSUESINSOCIALNETWORKS 6

Theevolutionof privacyandsecurityconcernswith networked technologies, Contextual influences on privacy attitudes and behaviors, Anonymity in a networked world

UNITIII EXTRACTIONANDMININGINSOCIALNETWORKINGDATA 6

ExtractingevolutionofWebCommunityfromaSeriesofWebArchive,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, Big data and Privacy

UNITIV PREDICTINGHUMANBEHAVIORANDPRIVACYISSUES 6

Understandingandpredictinghumanbehaviorforsocialcommunities,Userdata
Management, Inference and Distribution, Enabling new human experiences, Reality mining, Context, Awareness, Privacyin online social networks,Trust in online environment,What is Neo4j, Nodes, Relationships, Properties

UNITV ACCESSCONTROL,PRIVACYANDIDENTITYMANAGEMENT 6

Understand the access control requirements for Social Network, Enforcing Access Control Strategies, Authentication and Authorization, Roles-based Access Control, Host, storage and network access control options, Firewalls, Authentication, and Authorization in Social Network, Identity & Access Management, Single Sign-on, Identity Federation, Identity providers and service consumers, The role of Identity provisioning

COURSEOUTCOMES:

CO1: Developsemanticwebrelatedsimpleapplications

CO2:AddressPrivacyandSecurityissuesinSocialNetworking

CO3:Explainthedataextractionandminingofsocialnetworks

CO4:Discussthepredictionofhumanbehaviorinsocialcommunities

CO5:Describetheapplicationsofsocialnetworks

30PERIODS

PRACTICALEXERCISES:

30PERIODS

1. Designownsocialmediaapplication
2. CreateaNetworkmodelusingNeo4j
3. ReadandwriteDatafromGraphDatabase
4. Find“FriendofFriends”usingNeo4j
5. Implementsecuresearchinsocialmedia
6. CreateasimpleSecurity&Privacydetector

TOTAL:60PERIODS

TEXTBOOKS

1. PeterMika,“SocialNetworksandtheSemanticWeb,FirstEdition,Springer2007.
2. BorkoFurht,“HandbookofSocialNetworkTechnologiesandApplication,FirstEdition, Springer, 2010.
3. LearningNeo4j3.x–SecondEditionByJérômeBaton,RikVanBruggen,Packtpublishing
4. David Easley, Jon Kleinberg, “Networks, Crowds, and Markets: Reasoning about aHighly ConnectedWorld‖,FirstEdition, CambridgeUniversityPress, 2010.

REFERENCES

1. Easley D. Kleinberg J., “Networks, Crowds, and Markets – Reasoning about a

Highly ConnectedWorld‖, Cambridge University Press, 2010.
2. Jackson,MatthewO.,“SocialandEconomicNetworks”,PrincetonUniversityPress,2008.
3. GuandongXu ,Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, First Edition, Springer, 2011.
4. Dion Goh and Schubert Foo, “Social information Retrieval Systems: EmergingTechnologies and Applications for Searching the Web Effectively”, IGI Global Snippet,2008.
5. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modeling”, IGI Global Snippet, 2009.
6. John G. Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

22AIDC64D **MODERNCRYPTOGRAPHY** **LTPC**

202 3

COURSEOBJECTIVES:

- TolearnaboutModernCryptography.
- Tofocusonhowcryptographicalgorithmsandprotocolsworkandhowtousethem.
- TobuildaPseudorandompermutation.
- ToconstructBasiccryptanalytictechniques.
- Toprovideinstructiononhowtousetheconceptsof block ciphersandmessage authentication codes.

UNITI INTRODUCTION 6

Basics of Symmetric Key Cryptography, Basics of Asymmetric Key Cryptography, Hardness of Functions. Notions of Semantic Security (SS) and Message Indistinguishability (MI): Proof of Equivalence of SS and MI, Hard Core Predicate, Trap-door permutation, Goldwasser-Micali Encryption. Goldreich-Levin Theorem: Relation between Hardcore Predicates and Trap-door permutations.

UNITII FORMALNOTIONSOFATTACKS 6

Attacks under Message Indistinguishability: Chosen Plaintext Attack (IND-CPA), ChosenCiphertext Attacks (IND-CCA1 and IND-CCA2), Attacks under MessageNon-malleability: NM-CPA and NM-CCA2, Inter-relations among the attack model

UNITIII RANDOMORACLES 6

Provable Security and asymmetric cryptography, hash functions. One-way functions: Weak and Strong one-way functions. Pseudo-random Generators (PRG): Blum-Micali-Yao Construction, Construction of more powerful PRG, Relation between One-way functions and PRG, Pseudo-random Functions (PRF)

UNITIV BUILDINGAPSEUDORANDOMPERMUTATION 6

The LubyRackoff Construction: Formal Definition, Application of the LubyRackoff Construction to the construction of Block Ciphers, The DES in the light of LubyRackoff Construction.

UNITV MESSAGEAUTHENTICATIONCODES 6

Left orRight Security(LOR).FormalDefinitionofWeak andStrong MACs, Using aPRFasaMAC, Variable length MAC. Public Key Signature Schemes: Formal Definitions, Signing and Verification, Formal Proofs of Security of Full Domain Hashing. Assumptions for Public Key SignatureSchemes: One-way functions Imply Secure One-time Signatures. Shamir's Secret Sharing Scheme. Formally Analyzing Cryptographic Protocols. Zero Knowledge Proofs and Protocols.

30 PERIODS

PRACTICALEXERCISES: 30PERIODS

1. ImplementFeige-Fiat-Shamiridentificationprotocol.

2. ImplementGQidentificationprotocol.

3. ImplementSchnorridentificationprotocol.
4. ImplementRabinone-timesignaturescheme.
5. ImplementMerkleone-timesignaturescheme.
6. ImplementAuthenticationtreesandone-timesignatures.
7. ImplementGMRone-timesignaturescheme.

COURSEOUTCOMES:

CO1:Interpretthebasicprinciplesofcryptographyandgeneralcryptanalysis.

CO2:Determinetheconceptsofsymmetricencryptionandauthentication.

CO3 Identifytheuseofpublickeyencryption,digitalsignatures,andkeyestablishment.

CO4: Articulate the cryptographic algorithms to compose, build and analyze simple cryptographic solutions.

CO5:ExpresstheuseofMessageAuthenticationCodes.

TOTAL:60PERIODS

TEXTBOOKS:

1. HansDelfs and Helmut Knebl,Introduction to Cryptography:Principles andApplications, Springer Verlag.
2. Wenbo Mao, Modern Cryptography, Theory and Practice, Pearson Education (Low Priced Edition)

REFERENCES:

1. ShaffiGoldwasser andMihirBellare, LectureNotesonCryptography, Available at http://citeseerx.ist.psu.edu/.
2. OdedGoldreich, Foundations of Cryptography, CRC Press (Low Priced Edition Available), Part 1 and Part 23
3. WilliamStallings,“CryptographyandNetworkSecurity:Principlesand Practice”,PHI3rd Edition, 2006.

22AIDC64E	**ENGINEERINGSECURESOFTWARESYSTEMS**	**LTP C**
		202 3

COURSEOBJECTIVES:

- Knowtheimportanceandneedforsoftwaresecurity.
- Knowaboutvariousattacks.
- Learnaboutsecuresoftwaredesign.
- Understandriskmanagementinsecuresoftwaredevelopment.
- Knowtheworkingoftoolsrelatedtosoftwaresecurity.

UNITI NEEDOFSOFTWARESECURITYANDLOW-LEVELATTACKS 6

Software Assurance and Software Security - Threats to software security - Sources of software insecurity - Benefits of Detecting Software Security - Properties of Secure Software – Memory-Based Attacks: Low-Level Attacks Against Heap and Stack - Defense Against Memory-Based Attacks

UNITII SECURESOFTWAREDESIGN 7

Requirements Engineering for secure software - SQUARE process Model - Requirements elicitation and prioritization- Isolating The Effects of Untrusted Executable Content - Stack Inspection – Policy Specification Languages – Vulnerability Trends – Buffer Overflow – Code Injection - Session Hijacking. Secure Design - Threat Modeling and Security Design Principles

UINTIII SECURITYRISKMANAGEMENT 5

RiskManagementLifeCycle–Risk Profiling –Risk ExposureFactors–RiskEvaluationand Mitigation – Risk Assessment Techniques – Threat and Vulnerability Management

UNITIV SECURITYTESTING 8

Traditional Software Testing – Comparison - Secure Software Development Life Cycle - Risk Based Security Testing – Prioritizing Security TestingWith Threat Modeling – Penetration Testing –PlanningandScoping-Enumeration–RemoteExploitation–WebApplicationExploitation-ExploitsandClientSideAttacks–PostExploitation–BypassingFirewallsandAvoidingDetection -ToolsforPenetrationTesting

UNITV SECUREPROJECTMANAGEMENT 4

Governanceandsecurity-Adoptinganenterprisesoftwaresecurityframework -Securityand project management - Maturity of Practice

30 PERIODS

PRACTIA LEXERCISES

1. ImplementtheSQLinjectionattack.
2. ImplementtheBufferOverflowattack.
3. ImplementCrossSiteScriptingandPreventXSS.
4. PerformPenetrationtestingonawebapplicationtogatherinformationaboutthesystem, then initiate XSS and SQL injection attacks using tools like Kali Linux.
5. Developandtestthesecuretestcases
6. Penetrationtestusingkali Linux

30 PERIODS

COURSEOUTCOMES:

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

CO1: Identifyvariousvulnerabilitiesrelatedtomemoryattacks.

CO2: Apply security principles in software development.

CO3: Evaluatetheextentof risks.

CO4: Involveselectionoftestingtechniquesrelatedtosoftwaresecurityinthetestingphaseof software development.

CO5: Usetoolsforsecuringsoftware.

TOTAL:60PERIODS

TEXTBOOKS:

1. JuliaH.Allen,“SoftwareSecurityEngineering”,PearsonEducation,2008
2. EvanWheeler,“SecurityRisk Management:BuildinganInformationSecurityRisk Management Program from the Ground Up”, First edition, Syngress Publishing, 2011
3. ChrisWysopal, LucasNelson, Dino DaiZovi, and Elfriede Dustin, “TheArt of Software Security Testing: Identifying Software Security Flaws (Symantec Press)”, Addison-

Wesley Professional, 2006

REFERENCES:

1. Robert C. Seacord, “Secure Coding in C and C++ (SEI Series in Software Engineering)”, Addison-Wesley Professional, 2005.
2. JonErickson,“Hacking:TheArtofExploitation”,2ndEdition,NoStarchPress,2008.
3. Mike Shema, “Hacking Web Apps: Detecting and Preventing Web Application Security Problems”, First edition, Syngress Publishing, 2012
4. Bryan Sullivan and Vincent Liu, “Web Application Security, A Beginner's Guide”, Kindle Edition, McGraw Hill, 2012
5. Lee Allen, “Advanced Penetration Testing for Highly-Secured Environments: The Ultimate Security Guide (Open Source: Community Experience Distilled)”, Kindle Edition, Packt Publishing,2012
6. JasonGrembi,“DevelopingSecureSoftware”

22AIDC64F CRYPTOCURRENCYANDBLOCKCHAINTECHNOLOGIES LTP C
202 3

COURSEOBJECTIVES:

- Tounderstandthebasicsof Blockchain
- TolearnDifferentprotocolsandconsensusalgorithmsinBlockchain
- TolearntheBlockchainimplementationframeworks
- TounderstandtheBlockchainApplications
- ToexperimenttheHyperledgerFabric,Ethereumnetworks

UNITI INTRODUCTIONTOBLOCKCHAIN 7

Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, Transactions- The Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree

UNITII BITCOINANDCRYPTOCURRENCY 6

A basic crypto currency, Creation of coins, Payments and double spending, FORTH – theprecursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay

UNITIII BITCOINCONSENSUS 6

BitcoinConsensus,ProofofWork(PoW)-HashcashPoW,BitcoinPoW,AttacksonPoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.

UNITIV HYPERLEDGERFABRIC&ETHEREUM 5

ArchitectureofHyperledgerfabricv1.1-chaincode-Ethereum:Ethereumnetwork,EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.

UNITV BLOCKCHAINAPPLICATIONS 6

Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.

COURSEOUTCOMES:

CO1: UnderstandemergingabstractmodelsforBlockchainTechnology

CO2: Identifymajorresearchchallengesandtechnicalgapsexisting betweentheoryandpractice in the crypto currency domain.

CO3: ItprovidesconceptualunderstandingofthefunctionofBlockchainasamethodofsecuring distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

CO4: ApplyhyperledgerFabricandEthereumplatformtoimplementtheBlockchainApplication.

30 PERIODS

PRACTICAL

30PERIODS

1. Install and understand Docker container, Node.js, Java and Hyperledger Fabric, Ethereum and perform necessary software installation on local machine/create instance on cloud to run.
2. Create and deploy a blockchain network using Hyperledger Fabric SDK for Java Set up and initialize the channel, install and instantiate chain code, and perform invoke and query on your blockchain network.
3. Interactwithablockchainnetwork.Executetransactionsandrequestsagainstablock chain network by creating an app to test the network and its rules.
4. Deploy an asset-transfer app using blockchain. Learn app development within a Hyperledger Fabric network.
5. Useblockchaintotrackfitnessclubrewards.Build a webappthatusesHyperledgerFabric to track and trace member rewards.
6. Car auction network: A Hello World example with Hyperledger Fabric Node SDK and IBM Blockchain Starter Plan. Use Hyperledger Fabricto invoke chain code while storing results and data in the starter plan

TOTAL:60PERIODS

TEXTBOOKS

1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2. 2.Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.

REFERENCES:

1. DanielDrescher,“BlockchainBasics”,FirstEdition,Apress,2017.
2. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. PrincetonUniversity Press, 2016.
3. MelanieSwan,“Blockchain:BlueprintforaNewEconomy”,O’Reilly, 2015
4. Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing

5. HandbookofResearchonBlockchainTechnology,publishedbyElsevierInc.ISBN: 9780128198162, 2020.

22AIDC64G **NETWORKSECURITY** **LTP C**
202 3

COURSEOBJECTIVES:

- Tolearnthefundamentalsof cryptography.
- Tolearnthekeymanagementtechniquesandauthenticationapproaches.
- Toexplorethenetworkandtransportlayersecuritytechniques.
- Tounderstandtheapplicationlayersecuritystandards.
- Tolearntherealtimesecuritypractices.

UNITI INTRODUCTION 8

Basicsofcryptography,conventionalandpublic-keycryptography,hashfunctions,authentication, and digital signatures.

UNITII KEYMANAGEMENTANDAUTHENTICATION 7

Key Management and Distribution: Symmetric Key Distribution, Distribution of Public Keys, X.509 Certificates,Public-KeyInfrastructure.UserAuthentication:RemoteUser-AuthenticationPrinciples, Remote User-Authentication Using Symmetric Encryption, Kerberos Systems, Remote User Authentication Using Asymmetric Encryption.

UNITIII ACCESSCONTROLANDSECURITY 4

Network Access Control: Network Access Control, Extensible Authentication Protocol, IEEE802.1X Port-Based Network Access Control - IP Security - Internet Key Exchange (IKE).Transport-Level Security: Web Security Considerations, Secure Sockets Layer, Transport Layer Security, HTTPS standard, Secure Shell (SSH) application.

UNITIV APPLICATIONLAYERSECURITY 5

Electronic Mail Security: Pretty Good Privacy, S/MIME, DomainKeys Identified Mail. Wireless Network Security: Mobile Device Security

UNITV SECURITYPRACTICES 6

Firewalls and Intrusion Detection Systems: Intrusion Detection Password Management, Firewall Characteristics Types of Firewalls, Firewall Basing, Firewall Location and Configurations. Blockchains, Cloud Security and IoT security

30PERIODS

PRACTICALEXERCISES:

30PERIODS

1. Implementsymmetrickeyalgorithms
2. Implementasymmetrickeyalgorithmsandkeyexchangealgorithms
3. Implementdigitalsignatureschemes
4. InstallationofWireshark,tcpdumpandobservedatatransferredinclient-server communication using UDP/TCP and identify the UDP/TCP datagram.
5. CheckmessageintegrityandconfidentialityusingSSL

6. ExperimentEavesdropping,Dictionaryattacks,MITMattacks
7. ExperimentwithSniffTrafficusingARPPoisoning
8. Demonstrateintrusiondetectionsystemusinganytool.
9. Explorenetworkmonitoringtools
10. StudytoconfigureFirewall,VPN

COURSEOUTCOMES:

Attheendofthiscourse,thestudentswillbeable:

CO1: Classifytheencryptiontechniques

CO2: Illustrate the key management technique and authentication.

CO3: Evaluatethesecuritytechniquesappliedtonetworkandtransportlayer

CO4: Discuss the application layer security standards.

CO5: Applysecuritypracticesforrealtimeapplications.

TOTAL:60PERIODS

TEXTBOOKS:

1. CryptographyandNetworkSecurity:PrinciplesandPractice,6thEdition,William Stallings, 2014, Pearson, ISBN 13:9780133354690.

REFERENCES:

1. NetworkSecurity:PrivateCommunicationsinaPublicWorld,M.Speciner,R.Perl man,C. Kaufman, Prentice Hall, 2002.
2. LinuxiptablesPocketReference,GregorN.Purdy,O'Reilly,2004,ISBN-13:978-0596005696.
3. LinuxFirewalls,byMichaelRash,NoStarchPress,October2007,ISBN:978-1-59327-141-1.
4. NetworkSecurity,FirewallsAndVPNs,J.MichaelStewart,Jones&BartlettLearnin g,2013, ISBN-10: 1284031675, ISBN-13: 978-1284031676.
5. TheNetworkSecurityTestLab:AStep-By-StepGuide,MichaelGregg,DreamtechPress, 2015, ISBN-10:8126558148, ISBN-13: 978-8126558148.

22AIDC64H AUGMENTEDREALITY/VIRTUALREALITY LTPC
2023

COURSEOBJECTIVES:

- ToimpartthefundamentalaspectsandprinciplesofAR/VRtechnologies.
- Toknowtheinternalsofthehardwareandsoftwarecomponentsinvolve dinthe development of AR/VR enabled applications.
- Tolearnaboutthegraphicalprocessingunitsandtheirarchitectures.
- TogainknowledgeaboutAR/VRapplicationdevelopment.
- ToknowthetechnologiesinvolvedinthedevelopmentofAR/VRbasedapplications.

UNITI INTRODUCTION 7

Introduction to Virtual Reality and Augmented Reality – Definition – Introduction to Trajectoriesand Hybrid Space-ThreeI'sof VirtualReality – Virtual RealityVs3D ComputerGraphics – Benefits of Virtual Reality – Components of VR System – Introduction to AR-AR Technologies-InputDevices – 3D Position Trackers – Types of Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces – Types of Gesture Input Devices – Output Devices

– Graphics Display – Human Visual System – Personal Graphics Displays – LargeVolume Displays – Sound Displays – Human Auditory System**.**

UNITII VRMODELING 6

Modeling – Geometric Modeling – Virtual Object Shape – Object Visual Appearance – Kinematics Modeling – Transformation Matrices – Object Position – Transformation Invariants –Object Hierarchies – Viewing the 3D World – Physical Modeling – Collision Detection – Surface Deformation – Force Computation – Force Smoothing and Mapping – Behavior Modeling – Model Management.

UNITIII VRPROGRAMMING 6

VR Programming – Toolkits and Scene Graphs –World ToolKit – Java 3D – Comparison of World ToolKit and Java 3D

UNITIV APPLICATIONS 6

Human Factors in VR – Methodology and Terminology – VR Health and Safety Issues – VR and Society-Medical Applications of VR – Education, Arts and Entertainment – Military VR Applications – Emerging Applications of VR – VR Applications in Manufacturing – Applications of VR inRobotics – Information Visualization – VR in Business – VR in Entertainment – VR in Education.

UNITV AUGMENTEDREALITY 5

Introduction to Augmented Reality-Computer vision for AR-Interaction-Modelling and Annotation- Navigation-Wearable devices

30 PERIODS

PRACTICALEXERCISES:

1. StudyoftoolslikeUnity,Maya,3DSMAX,ARtoolkit,VuforiaandBlender.
2. Usetheprimitiveobjectsandapplyvariousprojectiontypesbyhandlingcamera.
3. Downloadobjectsfromassetstoreandapplyvariouslightingandshadingeffects.
4. Modelthreedimensionalobjectsusingvariousmodellingtechniquesandapplytextures over them.
5. Create three dimensional realistic scenes and develop simple virtual reality enabled mobile applications which have limited interactivity.
6. Addaudioandtextspecialeffectstothedevelopedapplication.
7. DevelopVRenabledapplicationsusingmotiontrackersandsensorsincorporatingfull haptic interactivity.
8. DevelopARenabledapplicationswithinteractivitylikeElearningenvironment,Virtual walkthroughs and visualization of historic places.
9. DevelopARenabledsimpleapplicationslikehumananatomyvisualization,DNA/RNA structure visualization and surgery simulation.
10. DevelopsimpleMRenabledgamingapplications.

COURSEOUTCOMES:

Oncompletionofthecourse,thestudentswillbeableto:

CO1: Understand the basic concepts of AR and VR **CO2:**Understand the tools and technologies related to AR/VR **CO3:**KnowtheworkingprincipleofAR/VRrelatedSensordevices **CO4:**Design of various models using modeling techniques **CO5:**Develop AR/VRapplications in different domains**30 PERIODS**

TOTAL:60PERIODS

TEXTBOOKS:

1. CharlesPalmer,JohnWilliamson,“VirtualRealityBlueprints:CreatecompellingV R experiences for mobile”, Packt Publisher, 2018
2. DieterSchmalstieg, Tobias Hollerer, “Augmented Reality:Principles & Practice”, Addison Wesley, 2016
3. JohnVince,“IntroductiontoVirtualReality”,Springer-Verlag,2004.
4. William R. Sherman, Alan B. Craig: Understanding Virtual Reality – Interface, Application, Design”, Morgan Kaufmann, 2003

4. reatetype2virtualizationonESXI6.5server
5. CreateaVLANinCISCOpackettracer
6. InstallKVMinLinux
7. CreateNestedVirtualMachine(VMunderanotherVM)COURSEOUTCOMES:

CO1: AnalysethevirtualizationconceptsandHypervisor **CO2:** Apply the Virtualization for real-world applications **CO3:** Install & Configure the different VM platforms **CO4:** Experiment with the VM with various software

TEXTBOOKS

Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

1. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011

2. David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach

3. Chris Wolf,ErickM.Halter,“Virtualization:FromtheDesktoptotheEnterprise”,APress, 2005.

4. JamesE.Smith,RaviNair,“VirtualMachines:VersatilePlatformsforSystemsand Processes”, Elsevier/Morgan Kaufmann, 2005.

DavidMarshall,WadeA.Reynolds,“AdvancedServerVirtualization:VMwareandMicrosoft Platform in the Virtual Data Center”, Auerbach Publications

221AIDC65B MULTIMEDIAANDANIMATIONLTP C

202 3

COURSEOBJECTIVES:

- TograspthefundamentalknowledgeofMultimediaelementsandsystems
- TogetfamiliarwithMultimediafileformatsandstandards
- TolearntheprocessofAuthoringmultimediapresentations
- Tolearnthetechniquesofanimationin2Dand3DandforthemobileUI
- Toexploredifferentpopularapplicationsofmultimedia

UNITI INTRODUCTIONTOMULTIMEDIA 6

Definitions, Elements, Multimedia Hardware and Software, Distributed multimedia systems, challenges: security, sharing / distribution, storage, retrieval, processing, computing. Multimedia metadata, Multimedia databases, Hypermedia, Multimedia Learning.

UNITII MULTIMEDIAFILEFORMATSANDSTANDARDS 6

File formats – Text, Image file formats, Graphic and animation file formats, Digital audio and Video file formats, Color in image and video, Color Models. Multimedia data and file formats for the web.

UNITIII MULTIMEDIAAUTHORING 6

Authoringmetaphors,ToolsFeaturesand Types:CardandPageBasedTools,IconandObject Based Tools, Time Based Tools, Cross Platform Authoring Tools, Editing Tools, PaintingandDrawingTools,3DModelingandAnimationTools,ImageEditingTools, audioEditingTools,DigitalMovieTools,Creatinginteractivepresentations,virtuallearning, simulations.

UNITIV ANIMATION 6

Principles of animation: staging, squash and stretch, timing, onion skinning, secondary action, 2D, 2 ½ D, and 3D animation, Animation techniques: Keyframe, Morphing, Inverse Kinematics, Hand Drawn, Character rigging, vector animation, stop motion, motion graphics, , Fluid Simulation, skeletal animation, skinning Virtual Reality, Augmented Reality.

UNITV MULTIMEDIAAPPLICATIONS 6

Multimedia Big data computing, social networks, smart phones, surveillance, Analytics, Multimedia Cloud Computing, Multimedia streaming cloud, media on demand, security and forensics, Online social networking, multimedia ontology, Content based retrieval from digital libraries.

30PERIODS

LISTOF EXPERIMENTS:

WorkingwithImageEditingtools:

InstalltoolslikeGIMP/InkScape/Krita/Pencilandperformeditingoperations: ØUse

different selection and transform tools to modify or improve an image

ØCreatelogosandbannersforhomepagesofwebsites.

WorkingwithAudioEditingtools:

ØInstall tools like, Audacity / Ardour for audio editing, sound mixing and special effects like fade- in or fade-out etc.,

ØPerformaudiocompressionbychoosingapropercodec.

WorkingwithVideoEditingandconversiontools:

InstalltoolslikeOpenShot/Cinelerra/HandBrakeforeditingvideocontent. ØEdit

and mix video content, remove noise, create special effects, add captions.

ØCompress and convert video file format to other popular formats.

Workingwithweb/mobileauthoringtools:

Adapt/KompoZer/BlueGriffon/BlueFish/AptanaStudio/NetBeans/WordPress/Expression Web:

ØDesignsimpleHomepagewithbanners,logos,tablesquicklinks etc

ØProvide a search interface and simple navigationfrom the homepage to the inside pages of the website.

ØDesignResponsivewebpagesforuseonbothwebandmobileinterfaces.

WorkingwithAnimationtools:

Installtoolslike,Krita,WickEditor,Blender:

ØPerform a simple 2D animation with sprites

ØPerformsimple3Danimationwithkeyframes,kinematics

- WorkingwithMobileUIanimationtools:Origamistudio/Lottie/Frameretc.,

WorkingwithE-Learningauthoringtools:

InstalltoolslikeEdApp/Moovly/CourseLab/IsEazyandCamStudio/Ampache,VideoLAN:

ØDemonstrate screen recording and further editing for e-learning content.

ØCreateasimpleE-Learningmoduleforatopicofyour choice.

CreatingVRandARapplications:

ØAnyaffordableVRviewerlikeGoogleCardboardandanydevelopmentplatformlikeOpenspace 3D / ARCore etc.

Note: all tools listed are open source. Usage of any proprietary tools in place of open source tools is not restricted.

WEBREFERENCES:

1. https://itsfoss.com/
2. https://www.ucl.ac.uk/slade/know/3396
3. https://handbrake.fr/
4. https://opensource.com/article/18/2/open-source-audio-visual-production-tools https://camstudio.org/
5. https://developer.android.com/training/animation/overview
6. https://developer.android.com/training/animation/overview(UNIT-IV)

COURSEOUTCOMES:

- GetthebiggerpictureofthecontextofMultimediaanditsapplications
- Usethedifferenttypesofmediaelementsofdifferentformatsoncontent pages
- Author2Dand3Dcreativeandinteractivepresentationsfordifferenttargetmultimedia applications.
- Usedifferentstandardanimationtechniquesfor2D,21/2D,3Dapplications
- Understandthecomplexityofmultimediaapplicationsinthecontextofcloud,security, bigdata streaming, social networking, CBIR etc.,

TEXTBOOKS:

1. Ze-NianLi,MarkS.Drew,JiangchuanLiu,FundamentalsofMultimedia",ThirdEdition, Springer Texts in Computer Science, 2021. (UNIT-I, II, III)

REFERENCES:

1. John M Blain, The Complete Guide to Blender Graphics: Computer Modeling & Animation, CRC press, 3rd Edition, 2016.
2. GeraldFriedland,RameshJain,“MultimediaComputing”,CambridgeUniversityPress, 2018.
3. Prabhat K.Andleigh, Kiran Thakrar, “Multimedia System Design”, Pearson Education, 1stEdition, 2015.
4. MohsenAminiSalehi,XiangboLi,“MultimediaCloudComputingSystems”,Springer Nature, 1st Edition, 2021.
5. MarkGaimbruno,“3DGraphicsandAnimation”,SecondEdition,NewRiders,2002.
6. Rogers David, “Animation: Master – A Complete Guide (Graphics Series)”, Charles River Media, 2006.
7. Rick parent, “Computer Animation: Algorithms and Techniques”, Morgan Kauffman, 3rd Edition, 2012.
8. Emilio Rodriguez Martinez, Mireia Alegre Ruiz, “UI Animations with Lottieand After Effects: Create, render, and ship stunning After Effects animations natively on mobile with React Native”, Packt Publishing, 2022.

221AIDC65E DIGITALMARKETING LTP C
2023

COURSEOBJECTIVES:

- Theprimaryobjectiveof thismoduleistoexamineandexploretheroleandimportanceof digital marketing in today’s rapidly changing business environment.
- Italsofocusesonhowdigitalmarketingcanbeutilizedbyorganizationsandhow itseffectiveness can be measured.

UNITI INTRODUCTIONTOONLINEMARKET 6

Online Market space- Digital Marketing Strategy- Components - Opportunities for building Brand Website - Planning and Creation - Content Marketing.

UNITII SEARCHENGINEOPTIMISATION 6

Search Engine optimisation - Keyword Strategy- SEO Strategy - SEO success factors -On-Page Techniques - Off-Page Techniques. Search Engine Marketing- How Search Engine works- SEM components- PPC advertising -Display Advertisement

UNITIII E-MAILMARKETING 6

E- Mail Marketing - Types of E- Mail Marketing - Email Automation - Lead Generation - Integrating Email with Social Media and Mobile- Measuring and maximizing email campaign effectiveness. MobileMarketing-MobileInventory/channels-Locationbased;Contextbased;Couponsandoffers, Mobile Apps, Mobile Commerce, SMS Campaigns-Profiling and targeting

UNITIV SOCIALMEDIAMARKETING 6

SocialMedia Marketing -SocialMediaChannels-LeveragingSocialmediaforbrandconversations and buzz. Successful /benchmark Social media campaigns. Engagement Marketing- Building Customer relationships - Creating Loyalty drivers - Influencer Marketing.

UNITV DIGITALTRANSFORMATION 6

Digital Transformation & Channel Attribution- Analytics- Ad-words, Email, Mobile, Social Media, Web Analytics - Changing your strategy based on analysis- Recent trends in Digital marketing.

30PERIODS

PRACTICALEXERCISES: 30PERIODS

1. Subscribe to a weekly/quarterly newsletter and analyze how its content and structure aidwith the branding of the company and how it aids its potential customer segments.
2. Performkeywordsearchforaskincarehospitalwebsitebasedonsearchvolumeand competition using Google keyword planner tool.
3. DemonstratehowtousetheGoogleWebMastersIndexingAPI
4. Discussaninterestingcasestudyregardinghowaninsurancecompanymanagesleads.
5. Discussnegativeandpositiveimpactsand ethicalimplicationsofusingsocialmedia for political advertising.
6. DiscusshowPredictiveanalyticsisimpactingmarketingautomation

COURSEOUTCOMES:

CO1: Toexamineandexploretheroleandimportanceofdigitalmarketingintoday'srapidly changing business environment..

CO2: Tofocusesonhowdigitalmarketingcanbeutilizedby organizatio nsandhow itseffectiveness can be measured.

CO3: Toknowthekeyelementsof adigitalmarketing strategy.

CO4: Tostudyhowtheeffectivenessofadigitalmarketingcampaigncanbemeasured

CO5: Todemonstrateadvancedpracticalskillsincommondigitalmarketingtoolssuchas SEO, SEM, Social media and Blogs.

TOTAL:60PERIODS

TEXTBOOKS

1. FundamentalsofDigitalMarketingbyPuneetSinghBhatia;Publisher:PearsonEducation;
2. Firstedition(July2017);ISBN-10:933258737X;ISBN-13:978-9332587373.
3. Digital Marketing by Vandana Ahuja ;Publisher: Oxford University Press (April 2015).ISBN-10: 0199455449
4. Marketing 4.0: Moving from Traditional to Digital by Philip Kotler;Publisher: Wiley; 1stedition (April 2017); ISBN10: 9788126566938;ISBN 13: 9788126566938;ASIN: 8126566930.
5. Ryan, D. (2014). Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, Kogan Page Limited..
6. Barker, Barker, BormannandNeher(2017), Social Media Marketing: AStrategic Approach, 2E South-Western ,Cengage Learning.
7. Pulizzi,JBeginner'sGuidetoDigitalMarketing,McgrawHillEducation

221AIDC65H	**VISUALEFFECTS**	**LTP C**
		202 3

COURSEOBJECTIVES

- Togetabasicideaonanimationprinciplesandtechniques
- TogetexposuretoCGI,colorandlightelementsofVFX
- Tohaveabetterunderstandingofbasicspecialeffectstechniques
- Tohaveaknowledgeofstateof theart vfxtechniques
- Tobecomefamiliarwithpopularcompositingtechniques

UNITI ANIMATIONBASICS 6

VFX production pipeline, Principles of animation, Techniques: Keyframe, kinematics, Full animation,limitedanimation,Rotoscoping,stopmotion,objectanimation,pixilation,rigging,shape keys, motion paths.

UNITII CGI,COLOR,LIGHT 6

CGI – virtual worlds, Photorealism, physical realism, function realism, 3D Modeling and Rendering:color-Color spaces,colordepth,Colorgrading,coloreffects,HDRI, Light –Areaand mesh lights, image based lights, PBR lights, photometric light, BRDF shading model

UNITIII SPECIALEFFECTS 6

Special Effects –props,scaled models, animatronics, pyrotechniques, Schüfftan process, Particle effects – wind, rain, fog, fire

UNITIV VISUALEFFECTSTECHNIQUES 6

Motion Capture, Matt Painting, Rigging, Front Projection.Rotoscoping, Match Moving – Tracking, camera reconstruction, planar tracking, Calibration, Point Cloud Projection, Ground plane determination, 3D Match Moving

UNITV COMPOSITING 6

Compositing – chroma key, blue screen/green screen, background projection, alpha compositing, deep image compositing, multiple exposure, matting, VFX tools -Blender, Natron, GIMP.

30 PERIODS

<u>LaboratoryExperiments:</u>

Using Natron:

- o UnderstandingNatronEnvironment:
- o Workingwithcolorandusingcolorgrading
- o usingChannels
- o Mergingimages
- o UsingRotopaint
- o performingTrackingandstabilizing
- o Transformingelements
- o Stereoscopiccompositing

Using Blender:

ØMotionTracking –cameraandobjecttracking

ØCamera fx, colorgrading, vignettes ØCompositingimagesandvideofiles ØMultilayer rendering

30 PERIODS
TOTAL:60PERIODS

COURSEOUTCOMES

Attheendofthecourse,thestudentwillbeableto:

CO1: Toimplementanimationin2D/3Dfollowingtheprinciplesandtechniques
CO2: To use CGI, color and light elements in VFX applications
CO3: To create special effects using any of the state of the art tools
CO4: Toapplypopularvisualeffectstechniquesusingadvancedtools
CO5: TousecompositingtoolsforcreatingVFXforavarietyof applications

TEXTBOOKS:

1. ChrisRoda,RealTimeVisualEffectsfortheTechnicalArtist,CRCPress,1st Edition, 2022.
2. SteveWright,DigitalCompositingforfilmandvideo,Routledge,4th Edition,2017.
3. JohnGress,DigitalVisualEffectsandCompositing,NewRidersPress,1st Edition,2014.

REFERENCES:

1. JonGress,“DigitalVisualEffectsandCompositing”,NewRidersPress,1st Edition,2014.
2. Robin Brinkman, The Art and Science of Digital Compositing: Techniques for Visual Effects, Animation and Motion Graphics”, Morgan Kauffman, 2008.
3. Luiz Velho, Bruno Madeira, “Introduction to Visual Effects A Computational Approach”, Routledge, 2023.
4. JasmineKatatikarn,MichaelTanzillo,“LightingforAnimation:Theartofvisualstorytelling ,Routledge,1st Edition,2016.
5. EranDinur,“TheCompleteguidetoPhotorealism,forVisualEffects,Visualization
6. Jeffrey A. Okun, Susan Zwerman, Christopher McKittrick, “ The VES Handbook of Visual Effects: Industry Standard VFX Practices and Procedures”, Third Edition, 2020.and Games”, Routledge, 1st Edition, 2022.
7. https://www.blender.org/features/vfx/
8. https://natrongithub.github.io/

221AIDC66B	ROBOTICPROCESSAUTOMATION	LTP C
		202 3

COURSEOBJECTIVES:

- TounderstandthebasicconceptsofRoboticProcessAutomation.
- ToexposetothekeyRPAdesignanddevelopmentstrategiesandmethodologies.
- TolearnthefundamentalRPAlogicandstructure.
- ToexploretheExceptionHandling,DebuggingandLoggingoperationsinRPA.
- TolearntodeployandMaintainthesoftwarebot.

UNITI INTRODUCTIONTOROBOTICPROCESS AUTOMATION 6

Emergence of Robotic Process Automation (RPA), Evolution of RPA,Differentiating RPA from Automation - Benefits of RPA - Application areas of RPA, Components of RPA, RPA Platforms. Robotic Process Automation Tools - Templates, User Interface, Domains in Activities, Workflow Files.

UNITII AUTOMATIONPROCESSACTIVITIES 6

Sequence, Flowchart & Control Flow: Sequencing the Workflow, Activities, Flowchart, Control Flow for Decision making. Data Manipulation: Variables, Collection, Arguments, Data Table, Clipboard management, File operations Controls: Finding the control, waiting for a control, Act on a control, UiExplorer, Handling Events

UNITIII APPINTEGRATION,RECORDINGANDSCRAPING 6

App Integration, Recording, Scraping, Selector, Workflow Activities. Recording mouse and keyboardactionstoperformoperation,ScrapingdatafromwebsiteandwritingtoCSV. ProcessMining.

UNITIV EXCEPTIONHANDLINGANDCODEMANAGEMENT 6

Exception handling, Common exceptions, Logging- Debugging techniques, Collecting crashdumps, Error reporting.Code management and maintenance: Project organization, Nesting workflows, Reusability, Templates, Commenting techniques, State Machine.

UNITV DEPLOYMENTANDMAINTENANCE 6

Publishing using publish utility, Orchestration Server, Control bots, Orchestration Server to deploy bots, License management, Publishing and managing updates.RPAVendors

- OpenSourceRPA,Future ofRPA

30 PERIODS
PRACTICALEXERCISES: 30PERIODS

SetupandConfigureaRPAtoolandunderstandtheuserinterfaceofthetool:

1. CreateaSequencetoobtainuserinputsdisplaythemusingamessage box;
2. CreateaFlowcharttonavigatetoadesiredpagebasedonacondition;
3. CreateaStateMachineworkflowtocompareuserinputwitharandomnumber.
4. BuildaprocessintheRPAplatformusingUIAutomationActivities.
5. CreateanautomationprocessusingkeySystemActivities,VariablesandArguments
6. AlsoimplementAutomationusingSystemTrigger
7. Automateloginto(web)Emailaccount
8. Recordingmouseandkeyboardactions.

9. ScrapingdatafromwebsiteandwritingtoCSV
10. ImplementErrorHandlinginRPAplatform
11. Web Scraping
12. EmailQueryProcessing

TOTAL:60PERIODS

COURSEOUTCOMES:

Bytheendofthiscourse,thestudentswill beableto:

- EnunciatethekeydistinctionsbetweenRPAandexistingautomationtechniques and platforms.
- UseUiPathtodesigncontrolflowsandworkflowsforthetargetprocess
- Implementrecording,webscrapingandprocessminingbyautomation
- UseUIPathStudiotodetect,andhandleexceptionsinautomationprocesses
- ImplementanduseOrchestratorforcreation,monitoring,scheduling,and controlling of automated bots and processes**.**

TEXTBOOKS:

1. Learning Robotic Process Automation: Create Software robots and automate business processeswiththeleadingRPAtool-UiPathbyAlokManiTripathi,Packt Publishing,2018.
2. 2.Tom Taulli , “The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems”, Apress publications, 2020.

REFERENCES:

1. Frank Casale (Author), Rebecca Dilla (Author), Heidi Jaynes (Author), Lauren Livingston (Author),IntroductiontoRobotic Process Automation: aPrimer,InstituteofRoboticProcess Automation, Amazon Asia-Pacific Holdings Private Limited, 2018
2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant, Amazon Asia-Pacific Holdings Private Limited, 2018
3. AGerardusBlokdyk,“RoboticProcessAutomationRpaACompleteGuide“,2020

221AIDC66D CYBERSECURITY LTP C
202 3

COURSEOBJECTIVES:

- Tolearncybercrimeandcyberlaw.
- Tounderstandthecyberattacksandtoolsformitigatingthem.
- Tounderstandinformationgathering.
- Tolearnhowtodetect acyberattack.
- Tolearnhowtopreventacyberattack.

UNITI INTRODUCTION 6

Cyber Security – History of Internet – Impact of Internet – CIA Triad; Reason for Cyber Crime – Need for Cyber Security – History of Cyber Crime; Cybercriminals – Classification of Cybercrimes– A Global Perspective on Cyber Crimes; Cyber Laws – The Indian IT Act – Cybercrime and Punishment.

UNITII ATTACKSANDCOUNTERMEASURES 6

OSWAP; Malicious AttackThreats andVulnerabilities: Scopeof Cyber-Attacks– SecurityBreach – Types of Malicious Attacks – Malicious Software – Common Attack Vectors – Social engineering Attack – Wireless Network Attack – Web Application Attack – Attack Tools – Countermeasures.

UNITIII RECONNAISSANCE 5

Harvester – Whois – Netcraft – Host – Extracting Information from DNS – Extracting Information from E-mail Servers – Social Engineering Reconnaissance; Scanning – Port Scanning – Network Scanning and Vulnerability Scanning – Scanning Methodology – Ping Sweer Techniques – Nmap CommandSwitches –SYN – Stealth–XMAS –NULL –IDLE –FIN Scans –BannerGrabbing and OS Finger printing Techniques.

UNITIV INTRUSIONDETECTION 5

Host -Based Intrusion Detection – Network -Based Intrusion Detection – Distributed or Hybrid Intrusion Detection – Intrusion Detection Exchange Format – Honeypots – Example System Snort.

UNITV INTRUSIONPREVENTION 5

Firewalls and Intrusion Prevention Systems: Need for Firewalls – Firewall Characteristics and Access Policy – Types of Firewalls – Firewall Basing – Firewall Location and Configurations – Intrusion Prevention Systems – Example Unified Threat Management Products.

30 PERIODS

PRACTICALEXERCISES: 30PERIODS

1. InstallKaliLinuxonVirtualbox
2. ExploreKaliLinuxandbashscripting
3. PerformopensourceintelligencegatheringusingNetcraft,WhoisLookups,DNS Reconnaissance, Harvester and Maltego
4. Understandthenmapcommanddandscanatargetusingnmap
5. Installmetasploitable2onthevirtualboxandsearchforunpatchedvulnerabilities
6. UseMetasploittoexploitanunpatchedvulnerability
7. InstallLinusserveronthevirtualboxandinstallssh
8. UseFail2bantoscanlogfilesandbanIpsthatshowthemalicious signs
9. Launchbrute-forceattacksontheLinuxserverusing Hydra.
10. Performreal-timenetworktrafficanalysisanddatapocketloggingusingSnort

COURSEOUTCOMES:

Onsuccessfulcompletionofthiscourse,thestudentwillbeableto

CO1:Explainthebasicsofcybersecurity,cybercrimeandcyberlaw(K2)

CO2:Classifyvarioustypesofattacksandlearnthetoolstolaunchtheattacks(K2)

CO3 Applyvarioustoolstoperforminformationgathering(K3)

CO4:Applyintrusiontechniquestodetectintrusion(K3)

CO5:Applyintrusionpreventiontechniquestopreventintrusion(K3)

TOTAL:60PERIODS

TEXTBOOKS

1. AnandShinde,“IntroductiontoCyberSecurityGuidetotheWorldofCyberSecurity”, Notion Press, 2021 (Unit 1)

2. NinaGodbole,SunitBelapure,“CyberSecurity:UnderstandingCyberCrimes,Computer Forensics and Legal Perspectives”, Wiley Publishers, 2011 (Unit 1)

3. https://owasp.org/www-project-top-ten/

REFERENCES

1. David Kim, Michael G. Solomon, “Fundamentals of Information Systems Security”, Jones & Bartlett Learning Publishers, 2013 (Unit 2)

2. Patrick Engebretson, “The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made easy”, Elsevier, 2011 (Unit 3)

3. Kimberly Graves, “CEH Official Certified Ethical hacker Review Guide”, Wiley Publishers, 2007 (Unit 3)

4. William Stallings, Lawrie Brown, “Computer Security Principles and Practice”, Third Edition, Pearson Education, 2015 (Units 4 and 5)

5. Georgia Weidman, “Penetration Testing: A Hands-On Introduction to Hacking”, No Starch Press, 2014 (Lab)

221AIDC66E	QUANTUMCOMPUTING	LTP C
		202 3

COURSEOBJECTIVES:

- Toknowthebackgroundofclassicalcomputingandquantumcomputing.
- Tolearnthefundamentalconceptsbehindquantum computation.
- Tostudythedetailsofquantummechanicsanditsrelationto ComputerScience.
- Togainknowledgeaboutthebasichardwareandmathematicalmodelsofquantum computation.
- Tolearnthebasicsofquantuminformationandthetheorybehindit.

UNITI QUANTUMCOMPUTINGBASICCONCEPTS 6

Complex Numbers - Linear Algebra - Matrices and Operators - Global PerspectivesPostulates of Quantum Mechanics – Quantum Bits - Representations of Qubits - Superpositions

UNITII QUANTUMGATESANDCIRCUITS 5

Universallogicgates-Basicsinglequbitgates-Multiplequbitgates-Circuitdevelopment- Quantum error correction

UNITIII QUANTUMALGORITHMS 7

Quantumparallelism-Deutsch’salgorithm-TheDeutsch–Jozsaalgorithm-QuantumFourier transform and its applications - Quantum Search Algorithms: Grover’s Algorithm

UNITIV QUANTUMINFORMATIONTHEORY 6

Datacompression-Shannon’snoiselesschannelcodingtheorem-Schumacher’squantumnoiseless channel coding theorem - Classical information over noisy quantum channels

UNITV QUANTUMCRYPTOGRAPHY 6

Classicalcryptographybasicconcepts-Private keycryptography-Shor’sFactoringAlgorithm- Quantum Key Distribution - BB84 - Ekart 91

30 PERIODS

PRACTICALEXERCISES 30PERIODS

1. Singlequbitgatesimulation-QuantumComposer
2. Multiplequbitgatesimulation-QuantumComposer
3. Composingsimplequantumcircuitswithq-gatesandmeasuringtheoutputintoclassical bits.
4. IBMQiskitPlatformIntroduction
5. ImplementationofShor’sAlgorithms
6. ImplementationofGrover’sAlgorithm
7. ImplementationofDeutsch’sAlgorithm
8. ImplementationofDeutsch-Jozsa’sAlgorithm
9. IntegerfactorizationusingShor’sAlgorithm
10. QKDSimulation
11. MiniProjectsuchasimplementinganAPIforefficientsearchusingGrover’sAlgorithmsor

COURSEOUTCOMES:

Oncompletionofthecourse,thestudentswillbeableto:

CO1: Understandthebasicsofquantumcomputing.

CO2: UnderstandthebackgroundofQuantumMechanics.

CO3: Analyzethecomputationmodels.

CO4: Modelthecircuitsusingquantumcomputation. environments and frameworks.

CO5: Understandthequantumoperationssuchasnoiseanderror–correction.

TOTAL:60PERIODS

TEXTBOOKS:

1. Parag K Lala, Mc Graw Hill Education, “Quantum Computing, A Beginners Introduction”, First edition (1 November 2020).
2. MichaelA.Nielsen,IssacL.Chuang,“QuantumComputationandQuantumInformation”, Tenth Edition, Cambridge University Press, 2010.
3. ChrisBernhardt,TheMITPress;Reprintedition(8September2020),“QuantumComputingfor Everyone”.

REFERENCES

1. ScottAaronson,“QuantumComputingSinceDemocritus”,CambridgeUniversityPress,2013.
2. N.DavidMermin,“QuantumComputerScience:AnIntroduction”,CambridgeUniversity Press, 2007.

221AIDC66H	**3DPRINTINGANDDESIGN**	**LTP C**
		202 3

COURSEOBJECTIVES:

- Todiscussonbasicsof3D printing
Toexplaintheprinciplesof3Dprintingtechnique
- Toexplainandillustrateinkjettechnology
- Toexplainandillustratelasertechnology
- Todiscusstheapplicationsof3Dprinting

UNITI INTRODUCTION 6

Introduction;Designconsiderations–Material,Size,Resolution,Process;Modellingand viewing- 3D; Scanning; Model preparation – Digital; Slicing; Software; File formats

UNITII PRINCIPLE 6

Processes – Extrusion, Wire, Granular, Lamination, Photopolymerisation; Materials - Paper, Plastics, Metals, Ceramics, Glass, Wood, Fiber, Sand, Biological Tissues, Hydrogels, Graphene; Material Selection - Processes, applications, limitations;

UNITIII INKJETTECHNOLOGY 6

Printer-WorkingPrinciple,PositioningSystem,Printhead,Printbed,Frames,Motioncontrol;Print head Considerations – Continuous Inkjet,Thermal Inkjet, Piezoelectric Drop-On-Demand; Material Formulation for jetting; Liquid based fabrication – Continous jet, Mulitjet; Powder based fabrication – Colourjet.

UNITIV LASERTECHNOLOGY 6

LightSources–Types,Characteristics;Optics–Deflection, Modulation;Materialfeeding andflow – Liquid, powder; Printing machines – Types, Working Principle, Build Platform, Print bed Movement, Support structures;

UNITV INDUSTRIALAPPLICATIONS 6

ProductModels,manufacturing –Printedelectronics,Biopolymers,Packaging,Healthcare,Food, Medical, Biotechnology, Displays; Future trends;

30PERIODS

PRACTICALEXERCISES: 30PERIODS

1. StudytheinterfaceandbasictoolsintheCADsoftware.
2. Study3Dprinter(s)includingprintheads,buildenvelope,materialsusedandrelated support removal system(s).
3. Reviewofgeometrytermsofa3D mesh.
4. Commandsformovingfrom2Dto3D.
5. AdvancedCADcommandstonavigatemodelsin3Dspace
6. Designanyfoureverydayobjects

RefertowebsiteslikeThingiverse, ShapewaysandGitFabtodesignfoureverydayobjectsthat utilize the advantages of 3D printing

. ChoosefourmodelsfromasharingsitelikeThingiverse,ShapewaysorGitfab.

a. Improveuponafileandmakeityourown.Someideasinclude:

- Redesignitwithaspecificuserinmind
- Redesignitforaslightlydifferentpurpose
- Improvethelookoftheproduct

7. UsetheCAMsoftwaretopreparefilesfor3Dprinting.
8. Manipulatemachinemovementandmateriallayering.
9. Repaira3Dmesh using

a) Freewareutilities:AutodeskMeshMixer(http://goo.gl/x5nhYc),MeshLab(http://goo.gl/fgztLl)or Netfabb Basic or Cloud Service (http://goo.gl/Q1P47a)

b) Freewaretooltutorials:NetfabbBasicorCloudService(http://goo.gl/Q1P47a),Netfabband

MeshLab (http://goo.gl/WPOVec)
c) Professionaltools:MagicsorNetfabb
Equipment:one3Dprinterforevery10-15 students

COURSEOUTCOMES:

Attheendofthiscourse,thestudentswillbeableto:

CO1: Outlineandexaminethebasicconceptsof3Dprintingtechnology

CO2: Outline3Dprintingworkflow`

CO3 Explainandcategorisetheconceptsandworkingprinciplesof3Dprintingusinginkjet technique

CO4:Explainandcategorisetheworkingprinciplesof3Dprintingusinglasertechnique

CO5: Explainvariousmethodfordesigningandmodelingforindustrialapplications

TOTAL:60PERIODS

TEXTBOOKS

1. ChristopherBarnatt,3DPrinting:TheNextIndustrialRevolution,CreateSpaceIndependent Publishing Platform, 2013.
2. IanM. Hutchings,GrahamD.Martin,InkjetTechnologyforDigitalFabrication, JohnWiley& Sons, 2013.

REFERENCES:

1. Chua,C.K.,LeongK.F.andLimC.S.,Rapidprototyping:Principlesandapplications,second edition, World Scientific Publishers, 2010
2. IbrahimZeid,MasteringCADCAMTataMcGraw-HillPublishingCo.,2007
3. JoanHorvath,Mastering3DPrinting,APress,2014

22 22160E75 C	INDUSTRIALMANAGEMENT	L	T	P	C
		3	0	0	3

COURSEOBJECTIVES

- Tostudythebasicconceptsofmanagement;approachestomanagement;contributorstomanagementstudies;variousformsofbusinessorganizationandtradeunionsfunction in professional organizations.
- Tostudytheplanning;organizingandstaffingfunctionsofmanagementinprofessional organization.
- Tostudytheleading;controllinganddecisionmakingfunctionsofmanagementin professional organization.
- Tolearntheorganizationaltheoryinprofessionalorganization.
- Tolearntheprinciplesofproductivityandmodernconceptsinmanagementinprofessional organization.

UNI T–I INTRODUCTIONTOMANAGEMENT 9

Management: Introduction; Definition and Functions – Approaches to the study of Management – Mintzberg's Ten Managerial Roles – Principles of Taylor; Fayol; Weber; Parker – Forms ofOrganization: Sole Proprietorship;Partnership;Company(PrivateandPublic);Cooperative– PublicSectorVs Private Sector Organization – Business Environment: Economic; Social; Political; Legal – Trade Union: Definition; Functions; Merits & Demerits.

UNIT–II FUNCTIONSOFMANAGEMENT-I **9**

Planning:Characteristics; Nature;Importance; Steps;Limitation; Planning Premises; Strategic Planning; Vision & Mission statement in Planning– Organizing:Organizing Theory; Principles; Types; Departmentalization; Centralization andDecentralization; Authority&Responsibility – Staffing:Systems Approach; Recruiting and Selection Process; Human Resource Development (HRD) Concept and Design.

UNIT–III FUNCTIONSOFMANAGEMENT- II 9

Directing (Leading): Leadership Traits; Style; Morale; Managerial Grids(Blake-Mounton,Reddin)– Communication:Purpose;Model;Barriers– Controlling: Process; Types; Levels; Guidelines; Audit (External, Internal, Merits); Preventive Control – Decision Making: Elements; Characteristics; Nature; Process; Classifications.

UNIT–IV ORGANIZATIONTHEORY 9

Organizational Conflict: Positive Aspects;Individual; Role; Interpersonal; Intra Group; Inter Group;ConflictManagement–Maslow'shierarchyofneedstheory;Herzberg'smotivation-hygiene theory;McClelland'sthreeneedsmotivationtheory;Vroom'svalence-expectancytheory–Change Management: Concept of Change; Lewin'sProcessofChangeModel;SourcesofResistance; Overcoming Resistance; Guidelines to managing Conflict.

UNIT–V PRODUCTIVITYANDMODERNTOPICS 9

Productivity: Concept; Measurements; AffectingFactors; Methods to Improve – Modern Topics (concept, feature/characteristics, procedure, merits and demerits): Business Process Reengineering (BPR); Benchmarking; SWOT/SWOC Analysis; Total Productive Maintenance; Enterprise Resource Planning (ERP); Management of Information Systems (MIS).

TOTAL:45PERIODS

COURSEOUTCOMES:

Attheendofthecoursethestudentswouldbeableto

CO1 Explainbasicconceptsofmanagement;approachestomanagement;contributorsto managementstudies;variousformsofbusinessorganizationandtradeunionsfunctionin professional organizations.

CO2 Discusstheplanning;organizingandstaffingfunctionsofmanagementinprofessional organization.

CO3 Applytheleading;controllinganddecisionmakingfunctionsofmanagementinprofessional organization.

CO4 Discusstheorganizationaltheoryinprofessionalorganization.

CO5 Applyprinciplesofproductivityandmodernconceptsinmanagementinprofessional organization.

TEXTBOOKS:

1. M.GovindarajanandS.Natarajan,“PrinciplesofManagement”,PrenticeHallofIndia,New Delhi, 2009.
2. Koontz.H.andWeihrich.H.,“EssentialsofManagement:AnInternationalPerspective”,8th Edition, Tata McGrawhill, New Delhi, 2010.

REFERENCES:

1. JosephJ,Massie,“EssentialsofManagement”,4thEdition,PearsonEducation,1987.
2. Saxena,P.K.,“PrinciplesofManagement:AModernApproach”,GlobalIndia Publications, 2009.
3. S.Chandran,“OrganizationalBehaviours”,VikasPublishingHousePvt.Ltd.,1994.
4. RichardL.Daft,“OrganizationTheoryandDesign”,SouthWesternCollegePublishing,11th Edition, 2012.
5. S.TrevisCerto,“ModernManagementConceptsandSkills”,PearsonEducation,2018.

22153FE76A RENEWABLEENERGYSYSTEM

LTP C

300 3

COURSEOBJECTIVES:

- ToProvideknowledgeaboutvariousrenewableenergytechnologies
- ToenablestudentstounderstandanddesignaPVsystem.
- Toprovideknowledgeaboutwindenergysystem.
- ToProvideknowledgeaboutvariouspossiblehybridenergysystems
- Togainknowledgeaboutapplicationofvariousrenewableenergytechnologies

UNITI INTRODUCTION 9

Primary energy sources, renewable vs. non-renewable primary energy sources, renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.

UNITII SOLARENERGY 9

Solar Radiation and its measurements, Solar Thermal Energy Conversion from plate Solar Collectors, Concentrating Collectors and its Types, Efficiency and performance of collectors,.Direct Solar Electricity

Conversion from Photovoltaic, types of solar cells and its application of battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Recent Advances in PV Applications: Building Integrated PV, Grid Connected PV Systems,

UNITIII WINDENERGY 9

Wind energy principles, wind site and its resource assessment, wind assessment, Factors influencing wind, wind turbine components, wind energy conversion systems (WECS), Classification of WECS devices, wind electric generating and control systems, characteristics and applications.

UNITIVBIO-ENERGY 9

Energy from biomass, Principle of biomass conversion technologies/process and their classification, Bio gas generation, types of biogas plants, selection of site for biogas plant, classification of biogas plants, Advantage and disadvantages of biogas generation, thermal gasification of biomass, biomass gasifies, Application of biomass and biogas plants and their economics.

UNITV IOTHERTYPESOFENERGY 9

Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, types of wells, methodsof harnessingthe energy, potential inIndia. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini- hydel power plants and their economics.

TOTAL:45PERIODS

COURSEOUTCOMES:

Attheendofthecoursestudentswillbeableto:

CO1: Attainedknowledgeaboutvariousrenewableenergytechnologies

CO2:AbilitytounderstandanddesignaPVsystem.

CO3:Understandtheconceptofvariouswindenergysystem.

CO4:Gainedknowledgeaboutvariouspossiblehybridenergysystems

CO5: Attainedknowledgeaboutvariousapplicationofrenewableenergytechnologies

REFERENCES

1. Twidell&Wier,'RenewableEnergyResources'CRCPress(Taylor&Francis).
2. TiwariandGhosal/Narosa,'Renewableenergyresources'.
3. D.P.Kothari,K.C.Singhal,'Renewableenergysourcesandemergingtechnologies',P.H.I.
4. D.S.Chauhan,S.K.Srivastava,'Non–ConventionalEnergyResources',NewAge Publishers, 2006.
5. B.H.Khan,'Non–ConventionalEnergyResources',TataMcGrawHill,2006.

22153FE76A	RENEWABLEENERGY SYSTEM	LTP C
		300 3

COURSEOBJECTIVES:

- ToProvideknowledgeaboutvariousrenewableenergytechnologies
- ToenablestudentstounderstandanddesignaPVsystem.
- Toprovideknowledgeaboutwindenergysystem.
- ToProvideknowledgeaboutvariouspossiblehybridenergysystems
- Togainknowledgeaboutapplicationofvariousrenewableenergytechnologies

UNITI INTRODUCTION 9

Primary energy sources, renewable vs. non-renewable primary energy sources, renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.

UNITII SOLARENERGY 9

Solar Radiation and its measurements, Solar Thermal Energy Conversion from plate Solar Collectors, Concentrating Collectors and its Types, Efficiency and performance of collectors,.Direct Solar Electricity Conversion from Photovoltaic, types of solar cells and its application of battery charger, domestic lighting, street lighting, and water pumping, power generation schemes. Recent Advances in PV Applications: Building Integrated PV, Grid Connected PV Systems,

UNITIII WINDENERGY 9

Wind energy principles, wind site and its resource assessment, wind assessment, Factors influencing wind, wind turbine components, wind energy conversion systems (WECS), Classification of WECS devices, wind electric generating and control systems, characteristics and applications.

UNITIVBIO-ENERGY 9

Energy from biomass, Principle of biomass conversion technologies/process and their classification, Bio gas generation, types of biogas plants, selection of site for biogas plant, classification of biogas plants, Advantage and disadvantages of biogas generation, thermal gasification of biomass, biomass gasifies, Application of biomass and biogas plants and their economics.

UNITVOTHERTYPESOFENERGY 9

Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, types of wells, methodsof harnessingthe energy, potential inIndia. OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini- hydel power plants and their economics.

TOTAL:45PERIODS

COURSEOUTCOMES:

Attheendofthecoursestudentswillbeableto:

CO1: Attainedknowledgeaboutvariousrenewableenergytechnologies

CO2:AbilitytounderstandanddesignaPVsystem.

CO3:Understandtheconceptofvariouswindenergysystem.

CO4:Gainedknowledgeaboutvariouspossiblehybridenergysystems

CO5: Attainedknowledgeaboutvariousapplicationofrenewableenergytechnologies

REFERENCES

6. Twidell&Wier,'RenewableEnergyResources'CRCPress(Taylor&Francis).
7. TiwariandGhosal/Narosa,'Renewableenergyresources'.
8. D.P.Kothari,K.C.Singhal,'Renewableenergysourcesandemergingtechnologies',P.H.I.
9. D.S.Chauhan,S.K.Srivastava,'Non–ConventionalEnergyResources',NewAge Publishers, 2006.
10. B.H.Khan,'Non–ConventionalEnergyResources',TataMcGrawHill,2006.

22153FE76B **ELECTRICANDHYBRIDVEHICLES** **LTP C**

30 03

COURSEOBJECTIVES:

- The objective of thiscourse is to prepare thestudents toknowabout thegeneral aspects of Electric and Hybrid Vehicles (EHV), including architectures, modelling, sizing, and sub system design and hybrid vehicle control.

UNITI DESIGNCONSIDERATIONSFORELECTRICVEHICLES 9

Need for Electric vehicle- Comparative study of diesel, petrol, hybrid and electric Vehicles. Advantages and Limitations of hybrid and electric Vehicles.- Design requirement for electric vehicles- Range, maximum velocity, acceleration, power requirement, mass of thevehicle. Various Resistance- Transmission efficiency- Electric vehicle chassis and Body Design, Electric Vehicle Recharging and Refuelling Systems.

UNITII ENERGYSOURCES 9

Battery Parameters- - Different types of batteries – Lead Acid- Nickel Metal Hydride - Lithium ion- Sodium based- Metal Air. Battery Modelling - Equivalent circuits, Battery charging- Quick Charging devices. Fuel Cell- Fuel cell Characteristics- Fuel cell types-Half reactions of fuel cell. Ultra capacitors. Battery Management System.

UNITIII MOTORSANDDRIVES 9

Types of Motors- DC motors- AC motors, PMSM motors, BLDC motors, Switched reluctance motors working principle, construction and characteristics.

UNITIV POWERCONVERTERSANDCONTROLLERS 9

Solid state Switching elements and characteristics – BJT,MOSFET, IGBT,SCR and TRIAC - Power Converters – rectifiers, inverters and converters - Motor Drives - DC, AC motor, PMSM motors, BLDC motors, Switched reluctance motors – four quadrant operations –operating modes

UNITV HYBRIDANDELECTRICVEHICLES 9

Main components and working principles of a hybrid and electric vehicles, Different configurations of hybridandelectricvehicles.PowerSplitdevicesforHybridVehicles -Operationmodes-Control Strategiesfor Hybrid Vehicle - Economy of hybrid Vehicles - Case studyon specification of electric and hybrid vehicles.

TOTAL:45PERIODS

COURSEOUTCOMES:

Attheendofthiscourse,thestudentwillbeableto

CO1: Understandtheoperationandarchitectureofelectricandhybridvehicles

CO2:Identifyvariousenergysourceoptionslikebatteryandfuelcell

CO3:Selectsuitableelectricmotorforapplicationsinhybridandelectricvehicles. **CO4**:Explain the role of power electronics in hybrid and electric vehicles

CO5:Analyzetheenergyanddesignrequirementforhybridandelectricvehicles.

TEXTBOOKS:

1. IqbalHusain,“ElectricandHybridVehicles-DesignFundamentals”,CRCPress,2003
2. MehrdadEhsani,“ModernElectric,HybridElectricandFuelCellVehicles”,CRCPress,2005.

REFERENCES:

1. JamesLarminieandJohnLowry,“ElectricVehicleTechnologyExplained“JohnWiley&Sons,2003
2. LinoGuzzella,“VehiclePropulsionSystem”SpringerPublications,2005
3. RonHodKinson,“LightWeightElectric/HybridVehicleDesign”,ButterworthHeinemann Publication,2005.

22154FE77A	**ADDITIVEMANUFACTURING**	**LTPC** **3003**

COURSEOBJECTIVES:

- Tointroducethedevelopment,capabilities,applications,ofAdditiveManufacturing(AM), and its business opportunities.
- Tobeacquaintedwithvatpolymerizationandmaterialextrusionprocesses
- Tobefamiliarwithpowderbedfusionandbinderjettingprocesses.
- Togainknowledgeonapplicationsof directenergydeposition,andmaterialjetting processes.
- Toimpartknowledgeonsheetlaminationanddirectwritetechnologies.

UNITI INTRODUCTION 9

Overview - Need - Development of Additive Manufacturing (AM) Technology: Rapid Prototyping- Rapid Tooling - Rapid Manufacturing - Additive Manufacturing. AM Process Chain - ASTM/ISO 52900 Classification - Benefits - AMUnique Capabilities - AMFile formats: STL, AMF Applications: Building Printing, Bio Printing, Food Printing, Electronics Printing, Automobile, Aerospace, Healthcare. Business Opportunities in AM.

UNITII VATPOLYMERIZATIONANDMATERIALEXTRUSION 9

Photo polymerization: Stereolithography Apparatus (SLA)- Materials -Process - top down and bottom up approach - Advantages - Limitations - Applications. Digital Light Processing (DLP) - Process - Advantages - Applications.

Material Extrusion: Fused Deposition Modeling (FDM) - Process-Materials -Applications and Limitations.

UNITIII POWDERBEDFUSIONANDBINDERJETTING 9

PowderBedFusion:SelectiveLaserSintering(SLS):Process-PowderFusionMechanism- Materials andApplication.SelectiveLaserMelting(SLM),ElectronBeamMelting(EBM):Materials -Process-Advantagesand Applications.

BinderJetting:Three-DimensionalPrinting-Materials-Process-Benefits-Limitations- Applications.

UNITIV MATERIALJETTINGANDDIRECTEDENERGYDEPOSITION 9

MaterialJetting:MultijetModeling-Materials-Process-Benefits- Applications.

Directed Energy Deposition: Laser Engineered Net Shaping (LENS) - Process - Material Delivery - Materials -Benefits -Applications.

UNITV SHEETLAMINATIONANDDIRECTWRITETECHNOLOGY 9

Sheet Lamination: Laminated Object Manufacturing (LOM)- Basic Principle- Mechanism: Gluing or Adhesive Bonding - Thermal Bonding - Materials - Application and Limitation.

Ink-Based Direct Writing (DW): Nozzle Dispensing Processes, Inkjet Printing Processes, Aerosol DW -

Applications of DW.

TOTAL:45PERIODS

COURSEOUTCOMES:

Attheendofthiscoursestudentsshallbeableto:

CO1: RecognizethedevelopmentofAMtechnologyandhowAMtechnologypropagatedinto various businesses and developing opportunities.

CO2: Acquire knowledge on process vat polymerization and material extrusion processes and its applications.

CO3:Elaboratetheprocessandapplicationsofpowderbedfusionandbinderjetting.

CO4:Evaluatetheadvantages,limitations,applicationsofmaterialjettinganddirectedenergy deposition processes.

CO5:Acquireknowledgeonsheetlaminationanddirectwritetechnology.

TEXTBOOKS:

1. IanGibson,DavidRosen,BrentStucker,MahyarKhorasani"Additivemanufacturingtechnologies". 3rd edition Springer Cham, Switzerland. (2021). ISBN: 978-3-030-56126-0

2. Andreas Gebhardt and Jan-SteffenHötter "Additive Manufacturing: 3DPrintingfor Prototyping and Manufacturing", Hanser publications, United States, 2015, ISBN: 978-1-56990-582-

REFERENCES:

1. Andreas Gebhardt,"Understanding Additive Manufacturing: Rapid Prototyping,
2. Rapid Manufacturing", Hanser Gardner Publication, Cincinnati., Ohio, 2011, ISBN :9783446425521.
3. Milan Brandt, "Laser Additive Manufacturing: Materials, Design, Technologies,
4. and Applications", Woodhead Publishing., United Kingdom, 2016, ISBN: 9780081004333.
5. AmitBandyopadhyay andSusmitaBose,"AdditiveManufacturing",1st Edition,CRCPress., United States, 2015, ISBN-13: 978-1482223590.
6. KamraniA.K.andNasrE.A.,"RapidPrototyping:Theoryandpractice",Springer.,UnitedStates ,2006,ISBN:978-1-4614-9842-1.
7. Liou,L.W.andLiou,F.W.,"RapidPrototypingandEngineeringapplications:Atoolboxfor prototype development", CRC Press., United States, 2011,

22152FE77A ELECTRICAL,ELECTRONICANDMAGNETICMATERIALS LTP C
300 3

COURSEOBJECTIVES:

Themainlearningobjectiveofthiscourseistopreparethestudentsfor:

- Understandingtheimportanceofvariousmaterialsusedinelectrical,electronics and
- magneticapplications
- Acquiringknowledgeonthepropertiesofelectrical,electronicsandmagneticmaterials.
- Gainingknowledgeontheselectionofsuitablematerialsforthegivenapplication
- KnowingthefundamentalconceptsinSemiconductingmaterials
- Gettingequippedwiththematerialsusedinopticalandoptoelectronicapplications.

UNITI DIELECTRICMATERIALS 9

Dielectric asElectric Field Medium, leakagecurrents, dielectric loss, dielectric strength, breakdown voltage, breakdown in solid dielectrics, flashover, liquid dielectrics, electric conductivity in solid, liquid and gaseous dielectrics, Ferromagnetic materials, properties of ferromagnetic materials in static fields, spontaneous, polarization, curie point, anti-ferromagnetic materials, piezoelectric materials, pyroelectric materials.

UNITII MAGNETICMATERIALS 9

Classification of magnetic materials, spontaneous magnetization in ferromagnetic materials, magnetic Anisotropy, Magnetostriction, diamagnetism, magnetically soft and hard materials,special purpose materials, feebly magnetic materials, Ferrites, cast and cermet permanent magnets, ageing of magnets. Factors effecting permeability and Hysteresis

UNITIII SEMICONDUCTORMATERIALS 9

Properties of semiconductors, Silicon wafers, integration techniques, Large and very large scale Integration techniques. Concept of superconductivity; theories and examples for high temperature superconductivity; discussion on specific superconducting materials; comments on fabrication and engineering applications.

UNITIV MATERIALSFORELECTRICALAPPLICATIONS 9

Materials used for Resistors, rheostats, heaters, transmission line structures, stranded conductors, bimetals fuses, soft and hard solders, electric contact materials, electric carbon materials, thermocouple materials. Solid, Liquid and Gaseous insulating materials, Effect of moisture on insulation.

UNITV OPTICALANDOPTOELECTRONICMATERIALS 9

Principles of photoconductivity - effect of impurities - principles of luminescence-laser principles - He-Ne, injection lasers, LED materials - binary, ternary photoelectronic materials - LCD materials - photo detectors - applications of optoelectronic materials - optical fibres and materials - electro optic modulators - Kerr effect - Pockels effect.

TOTAL:45PERIODS

COURSEOUTCOMES:

Aftercompletionofthiscourse,thestudentswillbeableto

CO1: Understandvarioustypesofdielectricmaterials,theirpropertiesinvariousconditions.

CO2:Evaluatemagneticmaterialsandtheirbehavior.

CO3:Evaluate semiconductor materials and technologies.

CO4:Selectsuitablematerialsforelectricalengineeringapplications.

CO5: Identifyrightmaterialforopticalandoptoelectronicapplications

TEXTBOOKS:

1. PradeepFulay,“Electronic,MagneticandOpticalmaterials”,CRCPress,taylorandFrancis,2 nd illustrated edition, 2017.
2. “RKRajput”,“AcourseinElectricalEngineeringMaterials”,LaxmiPublications,2009.

REFERENCEBOOKS:

1. TKBasak,“AcourseinElectricalEngineeringMaterials”,NewAgeSciencePublications, 2009
2. TTTIMadras,“ElectricalEngineeringMaterials”,McGrawHillEducation,2004.
3. AdrianusJ.Dekker,“ElectricalEngineeringMaterials”,PHIPublication,2006.
4. S.P.Seth,P.V.Gupta“AcourseinElectricalEngineeringMaterials”,DhanpatRai& Sons, 2011.
5. C. Kittel,“IntroductiontoSolidStatePhysics”,7thEdition,

6.

7. JohnWiley&Sons,Singapore, (2006).

22153FE77A SENSORS LTPC 3 003

COURSEOBJECTIVES:

- To learn the various types of sensors, transducers, sensor output signal types, calibration techniques, formulation of system equation and its characteristics.
- Tounderstandbasicworkingprinciple,construction,Applicationandcharacteristicsof displacement, speed and ranging sensors.
- To understand and analyze the working principle, construction, application and characteristics of force, magnetic and heading sensors.
- To learn and analyze the working principle, construction, application and characteristics of optical, pressure, temperature and other sensors.
- To familiarize students with different signal conditioning circuits design anddata acquisition system.

UNITI SENSORCLASSIFICATION,CHARACTERISTICSANDSIGNALTYPES 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 Outputs - Signal Types - Analog and Digital Signals,PWM and PPM.

UNITII DISPLACEMENT,PROXIMITYANDRANGINGSENSORS 9

Displacement Sensors – Brush Encoders - Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – Range Sensors - Ultrasonic Ranging - Reflective Beacons - Laser Range Sensor (LIDAR) – GPS - RF Beacons.

UNITIII FORCE,MAGNETICANDHEADINGSENSORS 9

Strain Gage – Types, Working, Advantage, Limitation, and Applications: Load Measurement – Force and Torque Measurement - Magnetic Sensors – Types, Principle, Advantage, Limitation,and Applications - Magneto Resistive – Hall Effect, Eddy Current Sensor - Heading Sensors – Compass, Gyroscope and Inclinometers.

UNITIV OPTICAL,PRESSURE,TEMPERATUREANDOTHERSENSORS 9

Photo Conductive Cell, Photo Voltaic, Photo Resistive, LDR – Fiber Optic Sensors – Pressure – Diaphragm – Bellows - Piezoelectric - Piezo-resistive - Acoustic, Temperature – IC, Thermistor, RTD,Thermocouple– NonContactSensor-ChemicalSensors-MEMSSensors-Smart Sensors.

UNITV SIGNALCONDITIONING 9

Need for Signal Conditioning – Resistive, Inductive and Capacitive Bridges for Measurement - DC and AC Signal Conditioning - Voltage, Current, Power and Instrumentation Amplifiers – Filter and Isolation Circuits – Fundamentals of Data Acquisition System

TOTAL:45PERIODS

COURSEOUTCOMES

Uponsuccessfulcompletionofthecourse,studentsshouldbeableto:

CO1:Understandvarioussensoreffects,sensorcharacteristics,signaltypes,calibration

methodsandobtaintransferfunctionandempiricalrelationofsensors.Theycanalso analyze the densor response.
CO2: Analyze and select suitable sensor for displacement, proximity and range measurement.
CO3:Analyzeandselectsuitablesensorforforce,magneticfield,speed,positionanddirection measurement.
CO4:AnalyzeandSelectsuitablesensorforlightdetection,pressureandtemperature measurement and also familiar with other miniaturized smart sensors.
CO5:Selectanddesignsuitablesignalconditioningcircuitwithpropercompensationand linearizing element based on sensor output signal.

22154FE77B INDUSTRIALSAFETY

LTPC

3003

COURSEOBJECTIVES:

- To educate about the health hazards and the safety measures to be followed in the industrial environment.
- Describeindustriallegislations(FactoriesActs,Workmen'sCompensationandotherlaws) enacted for the protection of employees health at work settings
- DescribemethodsofpreventionandcontrolofOccupationalHealthdiseases,accidents/ emergencies and other hazards

UNITI INTRODUCTION 9

Need for developing Environment, Health and Safety systems in work places - Accident Case Studies - Status and relationship of Acts - Regulations and Codes of Practice - Role of trade union safety representatives. International initiatives - Ergonomics and work place.

UNITII OCCUPATIONALHEALTHANDHYGIENE 9

Definition of the term occupational health and hygiene - Categories of health hazards - Exposure pathways and human responses to hazardous and toxic substances - Advantages and limitationsof environmental monitoring and occupational exposure limits - Hierarchy of control measures for occupationalhealthrisks - Roleof personalprotective equipment andtheselection criteria- Effects on humans - control methods and reduction strategies for noise, radiation and excessive stress.

UNITIII WORKPLACESAFETYANDSAFETYSYSTEMS 9

Features of Satisfactory and Safe design of work premises – good housekeeping - lighting and colour, Ventilation and Heat Control – Electrical Safety – Fire Safety – Safe Systems of work for manual handling operations – Machine guarding – Working at different levels – Process and System Safety.

UNITIV HAZARDSANDRISKMANAGEMENT 9

Safetyappraisal-analysisandcontroltechniques–plantsafetyinspection–Accidentinvestigation - Analysis and Reporting – Hazard and Risk Management Techniques – major accident hazard control – Onsite and Offsite emergency Plans.

UNITV ENVIRONMENTALHEALTHANDSAFETYMANAGEMENT 9

Concept of Environmental Health and Safety Management – Elements of Environmental HealthandSafetyManagementPolicyandmethodsof itseffectiveimplementationand review–Elements of Management Principles – Education and Training – Employee Participation.

TOTAL:45PERIODS

COURSEOUTCOMES:

Aftercompletionofthiscourse,thestudentisexpectedtobeable to:

CO1: Describe,withexample,thecommonwork-relateddiseasesandaccidentsinoccupational setting

CO2:NameessentialmembersoftheOccupationalHealthteam

CO3: What rolescanacommunityhealthpractitionersplayinanOccupationalsetting toensurethe protection, promotion and maintenance of the health of the employee

PRINCIPLES OF MANAGEMENT

COURSE OBJECTIVES:

- Sketch the Evolution of Management.
- Extract the functions and principles of management.
- Learn the application of the principles in an organization.
- Study the various HR related activities.
- Analyze the position of self and company goals towards business.

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 andperformance – Direct and preventive control – Reporting.

COURSE OUTCOMES:

CO1: Upon completion of the course, students will be able to have clear understanding ofmanagerial functions like planning, organizing, staffing, leading & controlling.

CO2: Have same basic knowledge on international aspect of management.

CO3: Ability to understand management concept of organizing.

CO4: Ability to understand management concept of directing.

CO5: Ability to understand management concept of controlling.

TEXT BOOKS:

1. Harold Koontz and Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
2. Stephen P. Robbins and Mary Coulter, " Management", Prentice Hall (India)Pvt. Ltd.,10th Edition, 2009.

REFERENCES:

1. Robert Kreitner and MamataMohapatra, " Management", Biztantra, 2008.
2. Stephen A. Robbins and David A. Decenzo and Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
3. Tripathy PC and Reddy PN, "Principles of Management", Tata Mcgraw Hill, 1999.

TOTAL QUALITY MANAGEMENT L T P C3 0 0 3

COURSE OBJECTIVES:

- Teach the need for quality, its evolution, basic concepts, contribution of quality gurus, TQMframework, Barriers and Benefits of TQM.
- Explain the TQM Principles for application.
- Define the basics of Six Sigma and apply Traditional tools, New tools, Benchmarking andFMEA.
- Describe Taguchi's Quality Loss Function, Performance Measures and apply Techniqueslike QFD, TPM, COQ and BPR.
- Illustrate and apply QMS and EMS in any organization.

UNIT I INTRODUCTION 9

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of product and service quality –Definition of TQM-- Basic concepts of TQM - Gurus of TQM (Brief introduction)

-- TQM Framework- Barriers to TQM –Benefits of TQM.

UNIT II TQM PRINCIPLES 9

Leadership - Deming Philosophy, Quality Council, Quality statements and Strategic planning- Customer Satisfaction –Customer Perception of Quality, Feedback, Customer complaints, Service Quality, Kano Model and Customer retention – Employee involvement – Motivation, Empowerment,Team and Teamwork, Recognition & Reward and Performance Appraisal-- Continuous process improvement –Juran Trilogy, PDSA cycle, 5S and Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating and Relationship development.

UNIT III TQM TOOLS & TECHNIQUES I 9

The seven traditional tools of quality - New management tools - Six-sigma Process Capability-Bench marking - Reasons to benchmark, Benchmarking process, What to Bench Mark, Understanding Current Performance, Planning, Studying Others, Learning from the data, Using the findings, Pitfallsand Criticisms of Benchmarking - FMEA - Intent , Documentation, Stages: Design FMEA and Process FMEA.

UNIT IV TQM TOOLS & TECHNIQUES II 9

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

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

COURSE OUTCOMES:

CO1: Ability to apply TQM concepts in a selected enterprise.

CO2: Ability to apply TQM principles in a selected enterprise.

CO3: Ability to understand Six Sigma and apply Traditional tools, New tools,Benchmarking andFMEA.

CO4: Ability to understand Taguchi's Quality Loss Function, Performance Measures andapply QFD, TPM, COQ and BPR.

CO5: Ability to apply QMS and EMS in any organization.

TEXT BOOK:

1. Dale H.Besterfiled, Carol B.Michna,Glen H. Bester field,MaryB.Sacre, HemantUrdhwareshe and RashmiUrdhwareshe, “Total Quality Management”, Pearson Education Asia, RevisedThird Edition, Indian Reprint, Sixth Impression,2013.

REFERENCES:

1. Joel.E. Ross, “Total Quality Management – Text and Cases”,Routledge.,2017.
2. Kiran.D.R, “Total Quality Management: Key concepts and case studies, Butterworth – Heinemann Ltd, 2016.

ENGINEERING ECONOMICS AND FINANCIAL ACCOUNTING L T P C

3 0 0 3

COURSE OBJECTIVES:

- Understanding the concept of Engineering Economics.
- Implement various micro economics concept in real life.
- Gaining knowledge in the field of macro economics to enable the students to have better
- understanding of various components of macro economics.
- Understanding the different procedures of pricing.
- Learn the various cost related concepts in micro economics.

UNIT I DEMAND & SUPPLY ANALYSIS 9

Managerial Economics - Relationship with other disciplines - Firms: Types, objectives and goals - Managerial decisions - Decision analysis.Demand - Types of demand - Determinants of demand - Demand function – Demand elasticity - Demand forecasting - Supply - Determinants of supply - Supply function -Supply elasticity.

UNIT II PRODUCTION AND COST ANALYSIS 9

Production function - Returns to scale - Production optimization - Least cost input - Isoquants - Managerial uses of production function.Cost Concepts - Cost function - Determinants of cost - Short run and Long run cost curves - Cost Output Decision - Estimation of Cost.

UNIT III PRICING 9

Determinants of Price - Pricing under different objectives and different market structures - Price discrimination - Pricing methods in practice.

UNIT IV FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT) 9

Balance sheet and related concepts - Profit & Loss Statement and related concepts - - Financial Ratio Analysis - Cash flow analysis - Funds flow analysis - Comparative financial statements - Analysis & Interpretation of financial statements.

UNIT V CAPITAL BUDGETING (ELEMENTARY TREATMENT) 9

Investments - Risks and return evaluation of investment decision - Average rate of return - Payback Period - Net Present Value - Internal rate of return.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

Students able to

CO1: Upon successful completion of this course, students will acquire the skills to apply the basicsof economics and cost analysis to engineering and take economically sound decisions

CO2: Evaluate the economic theories, cost concepts and pricing policies

CO3: Understand the market structures and integration concepts

CO4: Understand the measures of national income, the functions of banks and concepts ofglobalization

CO5: Apply the concepts of financial management for project appraisal

TEXT BOOKS:

1. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi,2001.
2. Managerial Economics: Analysis, Problems and Cases - P. L. Mehta, Edition, 13. Publisher,Sultan Chand, 2007.

REFERENCES:

1. Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2011.
2. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg.Press, Texas, 2010.
3. Degarmo, E.P., Sullivan, W.G and Canada, J.R, “Engineering Economy”, Macmillan, NewYork, 2011.
4. Zahid A khan: Engineering Economy, "Engineering Economy", Dorling Kindersley, 2012
5. Dr. S. N. Maheswari and Dr. S.K. Maheshwari: Financial Accounting, Vikas, 2009

WELL-BEING WITH TRADITIONAL PRACTICES-YOGA, AYURVEDA AND SIDDHA

COURSE OBJECTIVES:

- To enjoy life happily with fun filled new style activities that help to maintain health also
- To adapt a few lifestyle changes that will prevent many health disorders
- To be cool and handbill every emotion very smoothly in every walk of life
- To learn to eat cost effective but healthy foods that are rich in essential nutrients
- To develop immunity naturally that will improve resistance against many health disorders

UNIT I HEALTH AND ITS IMPORTANCE 2+4

Health: Definition - Importance of maintaining health - More importance on prevention than treatment

Ten types of health one has to maintain - Physical health - Mental health - Social health - Financial health - Emotional health - Spiritual health - Intellectual health - Relationship health - Environmentalhealth - Occupational/Professional heath.

Present health status - The life expectancy-present status - mortality rate - dreadful diseases - Non-communicable diseases (NCDs) the leading cause of death - 60% - heart disease – cancer – diabetes - chronic pulmonary diseases - risk factors – tobacco – alcohol - unhealthy diet - lack of physical activities.

Types of diseases and disorders - Lifestyle disorders – Obesity – Diabetes - Cardiovascular diseases – Cancer – Strokes – COPD - Arthritis - Mental health issues.

Causes of the above diseases / disorders - Importance of prevention of illness - Takes care of health - Improves quality of life - Reduces absenteeism - Increase satisfaction - Saves time

Simple lifestyle modifications to maintain health - Healthy Eating habits (Balanced diet accordingto age) Physical Activities (Stretching exercise, aerobics, resisting exercise) - Maintaining BMI- Importance and actions to be taken

UNIT II DIET 4+6

Role of diet in maintaining health - energy one needs to keep active throughout the day - nutrients one needs for growth and repair - helps one to stay strong and healthy - helps to prevent diet-relatedillness, such as some cancers - keeps active and - helps one to maintain a healthy weight - helps toreduce risk of developing lifestyle disorders like diabetes – arthritis – hypertension – PCOD – infertility – ADHD – sleeplessness -helps to reduce the risk of heart diseases - keeps the teeth and bones strong.

Balanced Diet and its 7 Components - Carbohydrates – Proteins – Fats – Vitamins – Minerals - Fibre and Water.

Food additives and their merits & demerits - Effects of food additives - Types of food additives - Food additives and processed foods - Food additives and their reactions

Definition of BMI and maintaining it with diet

Importance - Consequences of not maintaining BMI - different steps to maintain optimal BM

Common cooking mistakes

Different cooking methods, merits and demerits of each method

UNIT III ROLE OF AYURVEDA & SIDDHA SYSTEMS IN MAINTAINING HEALTH 4+4

AYUSH systems and their role in maintaining health - preventive aspect of AYUSH - AYUSH asa soft therapy.

Secrets of traditional healthy living - Traditional Diet and Nutrition - Regimen of Personal and Social Hygiene - Daily routine (Dinacharya) - Seasonal regimens (Ritucharya) - basic sanitation andhealthy living environment - Sadvritta (good conduct) - for conducive social life.

Principles of Siddha & Ayurveda systems - Macrocosm and Microcosm theory - PancheekaranaTheory / (Five Element Theory) 96 fundamental Principles - Uyir Thathukkal (Tri-Dosha Theory) - Udal Thathukkal

Prevention of illness with our traditional system of medicine

Primary Prevention - To decrease the number of new cases of a disorder or illness - Health promotion/education, and - Specific protective measures - Secondary Prevention - To lower the rateof established cases of a disorder or illness in the population (prevalence) - Tertiary Prevention - Todecrease the amount of disability associated with an existing disorder.

UNIT IV MENTAL WELLNESS 3+4

Emotional health - Definition and types - Three key elements: the subjective experience -

the physiological response - the behavioral response - Importance of maintaining emotional health - Role of emotions in daily life -Short term and long term effects of emotional disturbances - Leading a healthy life with emotions - Practices for emotional health - Recognize how thoughts influence emotions - Cultivate positive thoughts - Practice self-compassion - Expressing a full range of emotions.

Stress management - Stress definition - Stress in daily life - How stress affects one's life - Identifyingthe cause of stress - Symptoms of stress - Managing stress (habits, tools, training, professional help)
- Complications of stress mismanagement.

Sleep - Sleep and its importance for mental wellness - Sleep and digestion.

Immunity - Types and importance - Ways to develop immunity

UNIT V YOGA 2+12

Definition and importance of yoga - Types of yoga - How to Choose the Right Kind for individualsaccording to their age - The Eight Limbs of Yoga - Simple yogasanas for cure and prevention of health disorders - What yoga can bring to our life.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Nutrition and Dietetics - Ashley Martin, Published by White Word Publications,New York, NY 10001, USA
2. Yoga for Beginners_ 35 Simple Yoga Poses to Calm Your Mind and Strengthen Your Body,by Cory Martin, Copyright © 2015 by Althea Press, Berkeley, California

REFERENCES

1. WHAT WE KNOW ABOUT EMOTIONAL INTELLIGENCE How It Affects Learning, Work, Relationships, and Our Mental Health, by Moshe Zeidner, Gerald Matthews, and Richard D.Roberts
2. A Bradford Book, The MIT Press, Cambridge, Massachusetts, London, England TheMindful Self-Compassion Workbook, Kristin Neff, Ph.D Christopher Germer, Ph.D, Published by The Guilford Press A Division of Guilford Publications, Inc.370 SeventhAvenue, Suite 1200, New York, NY 10001

1. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4799645/
2. Simple lifestyle modifications to maintain health
   https://www.niddk.nih.gov/health-information/diet-nutrition/changing-habits-better-health#:~:text=Make%20your%20new%20healthy%20habit,t%20have%20time%20to%20cook.
3. **Read more**: https://www.legit.ng/1163909-classes-food-examples-functions.html
4. https://www.yaclass.in/p/science-state-board/class-9/nutrition-and-health-5926
5. **Benefits of healthy eating** https://www.cdc.gov/nutrition/resources-publications/benefits-of-healthy-eating.html
6. **Food additives**
   https://www.betterhealth.vic.gov.au/health/conditionsandtreatments/food-additives
7. **BMI** https://www.hsph.harvard.edu/nutritionsource/healthy-weight/
   https://www.who.int/europe/news-room/fact-sheets/item/a-healthy-lifestyle---who-recommendations
8. **Yoga**
   https://www.healthifyme.com/blog/types-of-yoga/https://yogamedicine.com/guide-types-

yoga-styles/

Ayurveda : https://vikaspedia.in/health/ayush/ayurveda-1/concept-of-healthy-living-in-ayurveda

9. **Siddha** : http://www.tkdl.res.in/tkdl/langdefault/Siddha/Sid_Siddha_Concepts.asp
10. **CAM :** https://www.hindawi.com/journals/ecam/2013/376327/
11. **Preventive** herbs : https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3847409/

COURSE OUTCOMES:

After completing the course, the students will be able to: **CO1:**Learn the importance of different components of health

CO2:Gain confidence to lead a healthy life

CO3:Learn new techniques to prevent lifestyle health disorders

CO4:Understand the importance of diet and workouts in maintaining health

INDUSTRIAL SAFETY L T P C 3 0 0 0

COURSE OBJECTIVES

- To Understand the Introduction and basic Terminologies safety.
- To enable the students to learn about the Important Statutory Regulations and standards.
- To enable students to Conduct and participate the various Safety activities in the Industry.
- To have knowledge about Workplace Exposures and Hazards.
- To assess the various Hazards and consequences through various Risk Assessment Techniques.

UNIT I SAFETY TERMINOLOGIES

Hazard-Types of Hazard- Risk-Hierarchy of Hazards Control Measures-Lead indicators- lag Indicators-Flammability- Toxicity Time-weighted Average (TWA) - Threshold LimitValue (TLV) - Short Term Exposure Limit (STEL)- Immediately dangerous to life or health (IDLH)- acute and chronic Effects- Routes of Chemical Entry-Personnel Protective Equipment- Health and Safety Policy-Material Safety Data Sheet MSDS

UNIT II STANDARDS AND REGULATIONS

Indian Factories Act-1948- Health- Safety- Hazardous materials and Welfare- ISO 45001:2018 occupational health and safety (OH&S) - Occupational Safety and Health Audit IS14489:1998- Hazard Identification and Risk Analysis- code of practice IS 15656:2006

UNIT III SAFETY ACTIVITIES

Toolbox Talk- Role of safety Committee- Responsibilities of Safety Officers and

Safety Representatives- Safety Training and Safety Incentives- Mock Drills- On-site Emergency Action Plan- Off-site Emergency Action Plan- Safety poster and Display- Human Error Assessment

UNIT IV WORKPLACE HEALTH AND SAFETY

Noise hazard- Particulate matter- musculoskeletal disorder improper sitting poster and lifting Ergonomics RULE & REBA- Unsafe act & Unsafe Condition-Electrical Hazards- Crane Safety- Toxicgas Release

UNIT V HAZARD IDENTIFICATION TECHNIQUES

Job Safety Analysis-Preliminary Hazard Analysis-Failure mode and Effects Analysis- Hazard and Operability- Fault Tree Analysis- Event Tree Analysis Qualitative and Quantitative Risk Assessment-Checklist Analysis- Root cause analysis- What-If Analysis- and Hazard Identification and Risk Assessment

TOTAL : 45 PERIODS

COURSE OUTCOMES:

Course outcomes on completion of this course the student will be able:

CO1:Understand the basic concept of safety.

CO2:Obtain knowledge of Statutory Regulations and standards.

CO3:Know about the safety Activities of the Working Place.

CO4:Analyze on the impact of Occupational Exposures and their Remedies

CO5:Obtain knowledge of Risk Assessment Techniques.

TEXTBOOKS

1. R.K. Jain and Prof. Sunil S. Rao Industrial Safety, Health and Environment ManagementSystems KHANNA PUBLISHER
2. L. M. Deshmukh Industrial Safety Management: Hazard Identification and Risk ControlMcGraw-Hill Education

REFERENCES

1. Frank Lees (2012) ‘Lees’ Loss Prevention in Process Industries.Butterworth-Heinemannpublications, UK, 4th Edition.
2. John Ridley & John Channing (2008)Safety at Work: Routledge, 7th Edition.
3. Dan Petersen (2003) Techniques of Safety Management: A System Approach.

Alan Waring.(1996).Safety management system: Chapman

22AIDC64D					
B.Tech-22AIDC64E	Engineering Secure Software Systems	-	-	-	-
B.Tech-22AIDC64F	Cryptocurrency and Blockchain Technologies	-	-	-	-
B.Tech-22AIDC64G	Network Security	-	-	-	-
B.Tech-22AIDC64H	Security and Privacy in Cloud	-	-	-	-
B.Tech-221AIDC65A	Augmented Reality/Virtual Reality	-	-	-	-
B.Tech-221AIDC65B	Multimedia and Animation	-	-	-	-
B.Tech-221AIDC65C	Video Creation and Editing	-	-	-	-
B.Tech-221AIDC65D	UI and UX Design	-	-	-	-
B.Tech-221AIDC65E	Digital marketing	-	-	-	-
B.Tech-221AIDC65F	Multimedia Data Compression and Storage	-	-	-	-
B.Tech-221AIDC65G	Game Development	-	-	-	-
B.Tech-221AIDC65H	Visual Effects	-	-	-	-
B.Tech-221AIDC66A	Augmented Reality/Virtual Reality	-	-	-	-
B.Tech-21AIDC66B	Robotic Process Automation	-	-	-	-
B.Tech-221AIDC66C	Neural Networks and Deep Learning	-	-	-	-

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

School of Education

1.3.1 Mapping Cross-cutting

Academic Year 2022 - 2023

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues			
			Professional Ethics	Gender Sensitization	Human Values	Environment Sustainability
B.Ed & 22UGEDUGE	22130EP14A	Yoga, Health and Physical Education	√		√	
B.Ed & 22UGEDUGE	22130EP14B	Guidance and Counselling		√		√
B.Ed & 22UGEDUGE	22130EP14C	Education administration and Management		√	√	
B.Ed & 22UGEDUGE	22130EP14D	PRE – Primary Education	√	√		
B.Ed &22UGEDUGE	22130EP24A	Environmental Education			√	√
B.Ed & 22UGEDUGE	22130EP24B	Exploring library and other learning resources		√	√	
B.Ed & 22UGEDUGE	22130EP24C	Teaching Early Child Hood Education	√			√
B.Ed &22UGEDUGE	22130EP24D	Professional Course for teacher proficiency		√		√
B.Ed & 22UGEDUGE	22130EP33A	Peace Education	√		√	
B.Ed &22UGEDUGE	22130EP33B	Drama and Art in Education		√		√
B.Ed &22UGEDUGE	22130EP33C	Strengthening language proficiency		√		
B.Ed & 22UGEDUGE	22130EP33D	Gender Issues in Education			√	
B.Ed&22UGEDUGE	22130EP45A	Critical Understanding of ICT	√			√
B.Ed & 22UGEDUGE	22130EP45B	Understanding the Self		√	√	
B.Ed &22UGEDUGE	22130EP45C	Human Rights				
B.Ed & 22UGEDUGE	22130EP45D	Addressing special needs in Classroom	√		√	

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School of Education

1.3.1 Mapping Cross-cutting

Academic Year 2022 - 2023

Programme Name & Code	Course Code	Title of the Course	Cross cutting Issues			
			Professional Ethics	Gender Sensitization	Human Values	Environment Sustainability
M.Ed & 22PGEDUGE	22230SC15A	Early Child Care and Education	✓		✓	
M.Ed & 22PGEDUGE	22230SC15B	Women Education and Empowerment		✓	✓	
M.Ed & 22PGEDUGE	22230SC15C	Inclusive Education	✓		✓	
M.Ed &22PGEDUGE	22230SC25A	Advanced Educational Technology		✓		✓
M.Ed &22PGEDUGE	22230SC25B	Pre-Service and In- Service Teacher Education			✓	✓
M.Ed &22PGEDUGE	22230SC25C	Value Education	✓		✓	
M.Ed & 22PGEDUGE	22230SC35A	Trends in Indian Higher Education	✓			✓
M.Ed & 22PGEDUGE	22230SC35B	Education for differently abled learners		✓		✓
M.Ed & 22PGEDUGE	22230SC35C	Educational Planning Management and Financing of Education	✓		✓	
M.Ed & 22PGEDUGE	22230SC44A	Guidance and Counseling	✓			
M.Ed &22PGEDUGE	22230SC44B	Special Education		✓		✓
M.Ed &22PGEDUGE	22230SC44C	Inferential Statistics	✓		✓	

SCHOOL OF EDUCATION

B.Ed (2022 – 23)

1.3.1 Mapping

SEMESTER – I Course Structure

S.No	**Course Code**	**Course Title**	**Periods per week**			**Credits**	**Marks**
			L	**T**	**P**		
Group – A: Perspectives in Education(Core)							
1	22130PE11	Psychology of Learners and Learning	4	0	0	4	100
2	22130PE12	Assessment for Learning	4	0	0	4	100
Group – B: Curriculum and Pedagogic studies							
3	22130CP13A	Pedagogy of Tamil: Part - I	3	0	0	3	100
	22130CP13B	Pedagogy of English: Part - I					
	22130CP13C	Pedagogy of Mathematics: Part - I					
	22130CP13D	Pedagogy of Physical Science: Part - I					
	22130CP13E	Pedagogy of Biological Science: Part - I					
	22130CP13F	Pedagogy of Computer Science: Part - I					
	22130CP13G	Pedagogy of Social Science: Part - I					
	22130CP13H	Pedagogy of Commerce and Accountancy : Part - I					
	22130CP13I	Pedagogy of Economics: Part - I					
	22130CP13J	Pedagogy of History: Part - I					
	22130CP13K	Pedagogy of Geography: Part - I					
Group – C: Enhancing Professional Capabilities/Elective (Any One)							
4	22130EP14A	Yoga, Health and Physical Education	2	0	0	2	100
	22130EP14B	Guidance and Counselling					
	22130EP14C	Education administration and Management					
	22130EP14D	PRE – Primary Education					
Research Skill Development (RSD) Course							
5	22130CRS	Research Led Seminar	1	0	0	1	100
		Grand Total	**14**	**0**	**0**	**14**	**500**

Note: L: Lecture P: Practical T. Tutorial

SEMESTER –I I Course Structure
Credit and Marks Distribution

S.No	Course Code	Course Title	Periods per week			Credits	Marks
			L	T	P		
Group – A: Perspectives in Education(Core)							
1	22130PE21	Contemporary India and Education	4	0	0	4	100
2	22130PE22	Teaching and Learning	4	0	0	4	100
Group – B: Curriculum and Pedagogic studies							
3	22130CP23A	Pedagogy of Tamil: Part – II	3	0	0	3	100
	22130CP23B	Pedagogy of English: Part - II					
	22130CP23C	Pedagogy of Mathematics: Part - II					
	22130CP23D	Pedagogy of Physical Science: Part - II					
	22130CP23E	Pedagogy of Biological Science: Part - II					
	22130CP23F	Pedagogy of Computer Science: Part - II					
	22130CP23G	Pedagogy of Social Science: Part - II					
	22130CP23H	Pedagogy of Commerce and Accountancy : Part – II					
	22130CP23I	Pedagogy of Economics: Part - II					
	22130CP23J	Pedagogy of History: Part - II					
	22130CP23K	Pedagogy of Geography: Part - II					
Group – C: Enhancing Professional Capabilities/Elective (Any One)							
4	22130EP24A	Environmental Education	2	0	0	2	100
	22130EP24B	Exploring library and other learning resources					
	22130EP24C	Teaching Early Child Hood Education					
	22130EP24D	Professional Course for teacher proficiency					
PRACTICAL							
5	22130PC25	Practicum – Teaching competence	0	0	7	7	200
Research Skill Development (RSD) Course							
6	22130CRM	Research Methodology	3	0	0	3	100
7	22130CBR	Participation in Bounded Research	2	0	0	2	100
		Grand Total	**18**	**0**	**7**	**25**	**800**

Note: L: Lecture P: Practical T. Tutorial

SEMESTER – III Course Structure
Credit and Marks Distribution

S.No	Course Code	Course Title	Periods per week			Credits	Marks
			L	T	P		
Group – A: Perspectives in Education(Core)							
1	22130PE31	Knowledge and Curriculum	4	0	0	4	100
Group – B: Curriculum and Pedagogic studies							
2	22130CP32A	Pedagogy of Tamil: Part - III	3	0	0	3	100
	22130CP32B	Pedagogy of English: Part - III					
	22130CP32C	Pedagogy of Mathematics: Part - III					
	22130CP32D	Pedagogy of Physical Science: Part - III					
	22130CP32E	Pedagogy of Biological Science: Part - III					
	22130CP32F	Pedagogy of Computer Science: Part - III					
	22130CP32G	Pedagogy of Social Science: Part - III					
	22130CP32H	Pedagogy of Commerce and Accountancy : Part - III					
	22130CP32I	Pedagogy of Economics: Part – III					
	22130CP32J	Pedagogy of History: Part - III					
	22130CP32K	Pedagogy of Geography: Part - III					
Group – C: Enhancing Professional Capabilities/Elective (Any One)							
3	22130EP33A	Peace Education	2	0	0	2	100
	22130EP33B	Drama and Art in Education					
	22130EP33C	Strengthening language proficiency					
	22130EP33D	Gender Issues in Education					
		Grand Total	9	0	0	9	**300**

Note: L: Lecture P: Practical T. Tutorial

SEMESTER –I V Course Structure
Credit and Marks Distribution

S. No	Course Code	Course Title	Periods per week			Credits	Marks
			L	T	P		
Group – A: Perspectives in Education(Core)							
1	22130PE41	Creating an Inclusive school	4	0	0	4	100
2	22130PE42	Gender, School and Society	4	0	0	4	100
3	22130PE43	Language across the Curriculum	4	0	0	4	100
Group – B: Curriculum and Pedagogic studies							
4	22130CP44A	Pedagogy of Tamil: Part – IV	3	0	0	3	100
	22130CP44B	Pedagogy of English: Part - IV					
	22130CP44C	Pedagogy of Mathematics: Part - IV					
	22130CP44D	Pedagogy of Physical Science: Part - IV					
	22130CP44E	Pedagogy of Biological Science: Part - IV					
	22130CP44F	Pedagogy of Computer Science: Part - IV					
	22130CP44G	Pedagogy of Social Science: Part - IV					
	22130CP44H	Pedagogy of Commerce and Accountancy : Part - IV					
	22130CP44I	Pedagogy of Economics: Part - IV					
	22130CP44J	Pedagogy of History: Part - IV					
	22130CP44K	Pedagogy of Geography: Par t – IV					
Group – C: Enhancing Professional Capabilities/Elective (Any One)							
5	22130EP45A	Critical Understanding of ICT	2	0	0	2	100
	22130EP45B	Understanding the Self					
	22130EP45C	Human Rights					
	22130EP45D	Addressing special needs in Classroom					
PRACTICAL							
6	22130PC46	Practicum – Teaching competence	0	0	23	**23**	**300**
Research Skill Development (RSD) Course							
7	22130PEE	Program Exit Examination				3	100
		Grand Total	**17**	**0**	**23**	**43**	**900**

Note: L: Lecture P: Practical T. Tutorial

SCHOOL OF EDUCATION
M.Ed (2022 – 23)
1.3.1 Mapping

SEMESTER–I
Course Structure

SLNO.	COURSECODE	TITLE OF THE PAPERSPERSPECTIVECOURSE	Periodsperweek CREDITS				Total Marks
			L	T	P	Credits	
1	22230PC11	History and PoliticalEconomyofEducationinIndia	4	0	0	4	100
2	22230PC12	AdvancedEducationalPsychology	4	0	0	4	100
TOOLCOURSE							
3	22230TC13	BasicsinEducationalResearch	4	0	0	4	100
TEACHEREDUCATIONCOURSE							
4	22230TE14	TeacherEducationInIndiaElementary&SecondaryLevel	4	0	0	4	100
SPECIALIZATIONCORECOURSE(AnyOne)							
5	22230SC15A	EarlyChildCareandEducation	3	0	0	3	100
	22230SC15B	WomenEducationandEmpowerment					
	22230SC15C	InclusiveEducation					
ResearchSkillDevelopment(RSD)Course							
6	22230CRS	Research LedSeminar	1	0	0	1	100
		Total	**20**	**0**	**0**	**20**	**600**

L-Lecture,P-Practical,T-Tutorial

SEMESTER–II

Course Structure

SLNO.	**COURSECODE**	**TITLEOFTHEPAPERSPERSPECTIVECOURSE**	**Periods per weekCREDITS**				**Total Marks**
			L	T	P	Credits	
1	22230PC21	PhilosophyofEducation	4	0	0	4	100
2	22230PC22	CurriculumDesignandDevelopment	4	0	0	4	100
		TOOLCOURSE					
3	22230TC23	Advanced Educational Research andStatistics	4	0	0	4	100
		TEACHEREDUCATIONCOURSE					
4	22230TE24	PlanningandAdministrationofElementary&SecondaryEducation	4	0	0	4	100
		SPECIALIZATIONCORECOURSE(AnyOne)					
5	22230SC25A	AdvancedEducationalTechnology	3	0	0	3	100
	22230SC25B	Pre-service and In-serviceTeacherEducation					
	22230SC25C	ValueEducation					
6	22230PT26	**Practicum**	0	0	6	6	200
		ResearchSkillDevelopment(RSD)Course					
7	22230CBR	Participationin Bounded Research	2	0	0	2	100
		Total	**21**	**0**	**6**	**27**	**800**

L-Lecture,P-Practical,T-Tutorial

SEMESTER–III

Course Structure

SLNO.	COURSE CODE	TITLE OF THE PAPERSPERSPECTIVECOURSE	Periods per weekCREDITS L	T	P	Credits	Total Marks
1	22230PC31	Sociology of Education	4	0	0	4	100
2	22230PC32	AdvancedTechniquesofInstruction	4	0	0	4	100
		TOOLCOURSE					
3	22230TC33	Educational Measurement and Evaluation	4	0	0	4	100
		TEACHEREDUCATIONCOURSE					
4	22230TE34	**Curriculum,PedagogyandAssessmentat Elementary&Secondary Level**	4	0	0	4	100
		SPECIALIZATIONCORECOURSE(AnyOne)					
5	22230SC35A	Trends inIndianHigherEducation	3	0	0	3	100
	22230SC35B	Educationfordifferentlyabled learners					
	22230SC35C	EducationalPlanning,Management andFinancingofEducation					
		Total	**19**	**0**	**0**	**19**	**500**

L-Lecture,P-Practical,T-Tutorial

SEMESTER–IV

Course Structure

SLNO.	COURSECODE	TITLE OF THE PAPERS PERSPECTIVE COURSE	Periods per Week CREDITS				Total Marks
			L	T	P	Credits	
1	22230PC41	EducationalStudies	4	0	0	4	100
2	22230PC42	ComparativeEducation	4	0	0	4	100
TOOLCOURSE							
3	22230TC43	ICTonTeachingandLearning	4	0	0	4	100
SPECIALIZATIONTHEMATICCOURSE(AnyOne)							
4	22230SC44A	Guidanceand Counseling	3	0	0	3	100
	22230SC44B	SpecialEducation					
	22230SC44C	InferentialStatistics					
5	22230PT45	**Practicum-Dissertation**	0	0	10	10	300
6	22230PEE	ProgrammeExitExamination	**3**	0	0	3	100
		Total	**18**	**0**	**10**	**28**	**800**
ONLINECOURSE(CHOICEBASED)							
7		MOOCSWAYAM-1 Course(Notlessthan4weeks)	-	-	-	2	