VELS

INSTITUTE OF SCIENCE, TECHNOLOGY & ADVANCED STUDIES (VISTAS)

(DEEMED TO BE UNIVERSITY Estd. u/s 3 OF THE UGC ACT, 1956)

NAAC ACCREDITED

PALLAVARAM - CHENNAI - INDIA

School of Engineering
B.E Electrical and Electronics Engineering

PROGRAMME OUTCOME OF B.E / B.TECH PROGRAMME:

PO-1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2: Problem analysis: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3: Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5: 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.

PO-6: 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.

PO-7: 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.

PO-8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10: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.

PO-11: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.

PO-12: 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.

PROGRAME SPECIFIC OUTCOME

PSO-1:Apply the knowledge of Mathematics, Science and Electrical Engineering fundamentals to solve complex problems in electrical engineering.

PSO-2: Graduate will be able to analyze, design and provide an engineering solution in the areas related to Electric Drives systems.

PSO-3:Specify, architect, design and analyze systems that efficiently generate, transmit, distribute and utilize electrical power

PSO-4:Specify, design, prototype and test modern electronic systems that perform analog and digital processing functions.

PSO-5: Understand the principles and construction of electrical machines and determine their performance through testing

PSO-6: The ability to analyze, design, and implement communications systems.

PSO-7: To explore the scientific theories, methodologies and the latest cutting edge technologies in renewable energy engineering, and use this to solve the current and future energy problems across the world.

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School of Engineering

Department of Electrical and Electronics Engineering

The details of the suggested Board of Members for the Department of Electrical and Electronics Engineering are shown below

S. No	Name of the Board Member	Designation	Institute / Industry
Internal Members			
1	Dr. R. Krishnakumar	HOD-EEE & Chair person	Vels University
2	Dr. N. Shanmuga Sundaram	Assistant Professor	Vels University
3	Mrs. T. R. Premilla	Assistant Professor	Vels University
External Expert Members			
1	Dr. C. Umayal	Associate Professor	VIT University, Chennai Campus
2	Mr. T.Thandapani	Director-Tech,	RRT Electro Power (P) Ltd., Chennai
3	Mr. R. Sridhar	Alumni, Department of EEE, Vels University	Design Engineer – Lighting Domain, Enlighted Energy Systems Pvt. Ltd, Chenai

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NAAC ACCREDITED

PALLAVARAM - CHENNAI - INDIA

B.E
Electrical and Electronics Engineering

Curriculum and Syllabus

(Based on Choice Based Credit System)
Effective from the Academic Year
2015-2016

Department of Electrical and Electronics Engineering
School of Engineering

B.E - ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM

TOTAL CREDITS: 195

SEMESTER 1

Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
AECC	15GBE201	Technical English	3	0	0	3
Core	15GBE001	Mathematics-I	3	1	0	3
Core	15GBE002	Engineering Physics	3	1	0	3
Core	15GBE003	Fundamentals of Computing	3	1	0	3
Core	15GBE004	Engineering Graphics	2	0	3	4
Core	15GBE005	Engineering Practices Laboratory	0	0	3	2
Core	15GBE006	Engineering Physics Laboratory	0	0	3	2
Core	15GBE007	Computer Practices Laboratory	0	0	3	2
		Total	**14**	**3**	**12**	**22**

SEMESTER 2

Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
AECC	15GBE202	Communication Skills	3	0	0	3
Core	15GBE008	Mathematics-II	3	1	0	3
Core	15GBE009	Engineering Chemistry	3	1	0	3
Core	15GBE010	Material Science	3	0	0	3
Core	15EEE021	Circuit Theory	3	1	0	3
Core	15EEE___	Basic Civil and Mechanical Engineering	3	0	0	3
Core	15GBE011	Engineering Chemistry Laboratory	0	0	3	2
AECC	15GBE203	Language Laboratory	0	0	3	2
Core	15EEE022	Electric Circuits Laboratory	0	0	3	2

		Total	**18**	**3**	**9**	**24**

B.E - ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM

SEMESTER 3

Category	**Code No.**	**Course**	**Hours / Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
AECC	15GBE204	Environmental Science and Engineering	3	0	0	3
Core	15GBE012	Mathematics-III	3	1	0	3
Core	15EEE031	Electrical Machines –I	3	1	0	3
DSE	15EEE___	Discipline Specific Elective I	3	0	0	3
DSE	15EEE___	Discipline Specific Elective II	3	0	0	3
GE	15EEE___	Generic Elective I	3	0	0	3
SEC	15EEE___	Skill Enhancement Elective I	2	0	0	2
Core	15EEE032	Electrical Machines -I Laboratory	0	0	3	2
Core	15EEE033	Electronic Circuits and Digital Laboratory	0	0	3	2
		Total	**20**	**2**	**6**	**24**

SEMESTER 4

Category	**Code No.**	**Course**	**Hours / Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
Core	15GBE013	Numerical Methods	3	1	0	3
Core	15EEE041	Electrical Machines –II	3	0	0	3
Core	15EEE042	Control Systems	3	1	0	3
DSE	15EEE___	Discipline Specific Elective III	3	0	0	3
DSE	15EEE___	Discipline Specific Elective IV	3	0	0	3
GE	15EEE___	Generic Elective II	3	0	0	3
SEE	15EEE___	Skill Enhancement Elective II	2	0	0	2
Core	15EEE043	Electrical Machines –II Laboratory	0	0	3	2
Core	15EEE044	Measurements and Control Systems Laboratory	0	0	3	2
Core	15BESY41	Basic Life Skills	1	0	1	2

		Total	**21**	**2**	**7**	**26**

B.E - ELECTRICAL AND ELECTRONICS ENGINEERING
CURRICULUM

SEMESTER 5

Category	**Code No.**	**Course**	**Hours / Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
Core	15EEE051	Power Electronics	3	1	0	3
Core	15EEE052	Transmission and Distribution	3	0	0	3
Core	15EEE053	Electrical Machine Design	3	1	0	3
DSE	15EEE___	Discipline Specific Elective V	3	0	0	3
DSE	15EEE___	Discipline Specific Elective VI	3	0	0	3
GE	15EEE___	Generic Elective III	3	0	0	3
SEC	15EEE___	Skill Enhancement Elective III	2	0	0	2
Core	15EEE054	Power Electronics Laboratory	0	0	3	2
Core	15EEE055	Microprocessors and Microcontrollers Laboratory	0	0	3	2
Core	15EEE056	Electric circuits and power electronics simulation lab	0	0	2	2
		Total	**20**	**2**	**8**	**26**

SEMESTER 6

Category	**Code No.**	**Course**	**Hours / Week**			**Credits**
			Lecture	**Tutorial**	**Practical**	
Core	**15EEE061**	Electric Drives and Control	3	0	0	3
Core	15EEE062	Power System Analysis	3	1	0	3
Core	15EEE063	Special Electrical Machines	3	0	0	3
DSE	15EEE___	Discipline Specific Elective VII	3	0	0	3
DSE	15EEE___	Discipline Specific Elective VIII	3	0	0	3
GE	15EEE___	Generic Elective IV	3	0	0	3
SEC	15EEE___	Skill Enhancement Elective IV	2	0	0	2
Core	15EEE064	Drives and Control Laboratory	0	0	3	2

Core	15EEE065	Digital Signal Processing Laboratory	0	0	3	2
Core	15EEE066	In- plant training	0	0	0	2
		Total	**20**	**1**	**6**	**26**

B.E - ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM

SEMESTER 7

Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
Core	15EEE071	Power System Operation and Control	3	0	0	3
Core	15EEE072	High Voltage Engineering	3	0	0	3
Core	15EEE073	Power Systems Protection and Switch Gears	3	0	0	3
DSE	15EEE___	Discipline Specific Elective IX	3	0	0	3
DSE	15EEE___	Discipline Specific Elective X	3	0	0	3
GE	15EEE___	Generic Elective V	3	0	0	3
SEC	15EEE___	Skill Enhancement Elective V	2	0	0	2
Core	15EEE074	Power Systems Laboratory	0	0	3	2
Core	15EEE075	Design and Simulation Laboratory	0	0	3	2
Core	15EEE076	Mini Project / Seminar	0	0	3	2
		Total	**20**	**0**	**9**	**26**

SEMESTER 8

Category	Code No.	Course	Hours / Week			Credits
			Lecture	Tutorial	Practical	
DSE	15EEE___	Discipline Specific Elective XI	3	0	0	3
DSE	15EEE___	Discipline Specific Elective XII	3	0	0	3
GE	15EEE___	Generic Elective VI	3	0	0	3
Core	15EEE081	Project Work	0	0	21	12
		Total	**9**	**0**	**21**	**21**

LIST OF DISCIPLINE SPECFIC ELECTIVE COURSES

15EEE101 Electronic Devices and Circuits
15EEE102 Electromagnetic Theory
15EEE103 Linear Integrated Circuits
15EEE104 Measurement and Instrumentation
15EEE105 Power Plant Engineering
15EEE106 Digital Signal Processing
15EEE107 Computer Aided Power System Analysis
15EEE108 Electrical energy Utilization and Conservation
15EEE109 HVDC Transmissions
15EEE110 Power Electronics for Renewable Energy System
15EEE111 Optimization Techniques
15EEE112 Advanced Control Systems
15EEE113 Power Quality
15EEE114 Biomedical Instrumentation
15EEE115 Power System Transients
15EEE116 Fibre Optics and Laser Instruments
15EEE117 Flexible AC Transmission Systems
15EEE118 System Identification and Adaptive Control
15EEE119 Professional Ethics in Engineering
15EEE120 Power system Dynamics
15EEE121 Solid State Drives

LIST OF GENERIC ELECTIVE COURSES

15EEE151 Digital Logic Circuits
15EEE152 Data Structures using C++
15EEE153 Communication Engineering
15EEE154 Principles of Management& Professional Ethics
15EEE155 Total Quality Management
15EEE156 Embedded Systems

15EEE157	Advanced Digital Signal Processing
15EEE158	Fundamentals of Nano science
15EEE159	Micro Electro Mechanical System
15EEE160	Discrete Time systems and Signal Processing
15EEE161	Robotics and Automation
15EEE162	Digital System Design
15EEE163	VLSI Design
15EEE164	Applied Soft Computing
15EEE165	Microcontroller Based System Design
15EEE166	Neural Networks and Fuzzy Systems
15EEE167	PLC and Distributed control system

LIST OF SKILL ENHANCEMENT ELECTIVE COURSES

15GPD251	Personality Development-I
15GPD252	Personality Development-II
15GPD253	Personality Development-III
15GPD254	Personality Development-IV
15NSS255	NSS-I
15NSS256	NSS-II
15NSS257	NSS-III
15NSS258	NSS-IV
15NSS259	NSS-V
15NSS260	NSS-VI

SYLLABUS

CORE COURSES

15GBE201 TECHNICAL ENGLISH 3 0 0 3

COURSE OBJECTIVE:

To help students develop listening skills for academic and professional purposes. To help students acquire the ability to speak effectively in English in real life situations. To inculcate reading habit and to develop effective reading skills. To help students improve their active and passive vocabulary. To familiarize students with different rhetorical functions of scientific English. To enable students to adapt the professional skills.

COURSE OUTCOME:

CO-1: Empower their listening expertise so they might value its part in the LSRW aptitudes way to deal with dialect and enhance their articulation

CO-2: Furnish understudies with vital preparing in listening so that can appreciate the discourse of individuals of various foundations and areas.

CO-3: Make understudies mindful of the part of talking in English and its commitment to their prosperity.

CO-4: Empower understudies to convey what needs be fluidly and suitably in social and expert connections and oral hone.

CO-5 Describing objects/circumstances/individuals.

CO-6: Role play – Individual/Group exercises (Using practices from all the nine units of the endorsed content.

CO-7: Just a Minute (JAM) Sessions.

CO-8: Add to mindfulness in the understudies about the essentialness of noiseless perusing and perception.

CO-9: Add to the capacity of understudies to figure the implications of words from connection and handle the general message of the content, draw surmising and so forth.

CO-10: Add to mindfulness in the understudies about composing as an accurate and formal ability and to outfit them with the parts of various types of composing, starting with the lower request ones

UNIT I INTRODUCTION TO BASIC GRAMMAR AND VOCABULARY 9

General Vocabulary – Changing words from one form to another, Nouns- Compound nouns, Pronouns - Relative pronouns, Demonstrative pronouns, Adjectives - Comparative adjectives, Verbs- Modal verbs, Linking verbs, Adverbs, Word Links – Connectives, Sequence words, Introducing oneself, Interactive grammar exercises.

UNIT II BASIC SKILL- LISTENING AND INTERPRETATION 9

Listening Skills - Note Making and Note-Taking, Transformation of Sentences – Positive, Comparative, Superlative, Affirmative, Negative, Interrogative and Assertive, Formation of Questions. Information Transfer - Chart – Flow chart, Bar chart, Pie chart. Pair works, SAM sessions.

UNIT III BASIC SKILL- WRITING SKILL AND STRUCTURES 9

Creative thinking and speaking, Tenses – Present Tense – simple present, present continuous, present perfect, present perfect continuous, Past Tense - simple past, past continuous, past perfect, past perfect continuous, Future Tense -simple future, future continuous, future perfect, future perfect continuous, Autobiographical writing, JAM session.

UNIT IV BASIC SKILL- READING AND WRITING SKILL 9

Reading Skills- Skimming and Scanning, Comprehension Passage Paragraph Writing – Descriptive paragraph, Argumentative paragraph, Persuasive paragraph, Demonstrative paragraph, Compare and contrast, Conversations.

UNIT V BASIC SKILL- SPEAKING SKILL AND VOCABULARY 9

Vocabulary, Prefixes and Suffixes, Cause and Effect relationship, Clauses and Phrases, Super-ordinates and Hyponyms, Expressing Causal Relation, Article, Prepositions, Preposition phrases, Speaking about the future plans, Reading comprehensions, Situational dialogues.

TOTAL: 45 hours

TEXT BOOKS:

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.

REFERENCE BOOKS:

1. N. Lakshmana Peruma, lTechnical English-I , Second Edition, Hitech Publishing company PVT. Ltd,2009.
2. Sumant. S, 'Technical English', Second Edition, McGraw-Hill Education (India) Pvt.Ltd., 2008.
3. T.M. Farhathullah, "Communication Skills for Technical Students", Orient Blackswan Private Limited., 2008

15GBE001 MATHEMATICS-I 3 1 0 3

COURSE OBJECTIVE:

To develop the basic mathematical knowledge and computational skills of the students in the areas of applied mathematics. To develop the skills of the students in the areas of matrices, Three dimensional Analytical Geometry and calculus. To teach fundamental topics required for understanding Engineering studies. To serve as a pre-requisite mathematics course for post graduate courses, specialized studies and research.

COURSE OUTCOME:

CO- 1: To develop the use of matrix algebra techniques this is needed by engineers for practical applications.

CO- 2: Identify various types of matrices, add, subtract and multiply matrices, compute the rank of a matrix.

CO- 3: Solve system of equations and use matrices and determinants.

CO- 4: To make the student acquire sound knowledge of techniques in solving analytical geometry that model engineering problems.

CO- 5: To derive the Plane equation, structure equation of Right Circular Cone & Cylinder.

CO- 6: Understanding the ideas of differential calculus and facility in solving simple standard examples like radius of curvature , circle of curvature Evolutes, Envelopes and their Normal.

CO- 7: To familiarize the student with functions of several variables. This is needed in many branchesof engineering.

CO- 8: To make the functions of maxima and minima values.

CO- 9: To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.

UNIT I MATRICES 12

Characteristic equation – Eigenvalues and eigenvectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

UNIT II THREE DIMENSIONAL ANALYTICAL GEOMETRY 12

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone – Right circular cone – Equation of a cylinder – Right circular cylinder.

UNIT III DIFFERENTIAL CALCULUS **12**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes – Evolute as envelope of normals.

UNIT IV FUNCTIONS OF SEVERAL VARIABLES **12**

Partial derivatives – Euler's theorem for homogenous functions – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor's expansion – Maxima and Minima – Method of Lagrange's multipliers.

UNIT V MULTIPLE INTEGRALS **12**

Double integration – Cartesian and polar coordinates – Change of order of integration – Change of variables between Cartesian and polar coordinates – Triple integrals – Area as double integral

TOTAL: 60 hours

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications, Delhi, 43rd Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,6th reprint, 2008.

REFERENCE BOOKS:

1. Glyn James, "Advanced Modern Engineering Mathematics",Pearson Education ,3rd Edition, 2012.
2. Jain R.K and Iyengar S.R.K, "Advanced Engineering Mathematics", Narosa Publishing House , 4th Edition, 2014

15GBE002 ENGINEERING PHYSICS 3 1 0 3

COURSE OBJECTIVE:

To introduce the basic concepts of Physics and its applications to various branches of Engineering and Technology. To provide an overview of the working principles, and applications of the communication building blocks like lasers, fiber optics and semiconductor devices etc for performing their functions. To provide an overview of quantum, statistical mechanics and solid state physics. To gain the knowledge on existing future upcoming devices.

COURSE OUTCOME:

CO-1: Discuss the production of ultrasonics by different methods and their medical applications.
CO-2: Develop the types of lasers and find their applications.
CO-3: Develop the fiber optic communication system and find their applications.
CO-4: Relate the enhance knowledge about photonics and optical fiber communication system.
CO-5: Explain the fundamentals of quantum mechanical concepts and describe the phenomenon of electron microscopes.
CO-6: Illustrate the appropriate ways of solving quantum mechanical problems.

CO-7: Understand the efficacy of quantum equations in modern areas.

CO-8: Relate the crystallographic parameters and crystal growth techniques.

CO-9: Relate the concept of lasers and crystal physics.

CO-10: Apply the working knowledge of fundamental physics and basic engineering principles to include advanced knowledge in one or more engineering disciplines.

UNIT I ULTRASONICS 12

Introduction – Production – magnetostriction effect – magnetostriction generator – piezoelectric effect – piezoelectric generator – Detection of ultrasonic waves– properties – Cavitations – Velocity measurement – acoustic grating – Industrial applications – drilling, welding, soldering and cleaning –Non Destructive Testing – pulse echo system through transmission and reflection modes – A, B and C scan displays- SONAR – Medical applications – Sonograms.

UNIT II LASERS 12

Introduction – Principle of Spontaneous emission and stimulated emission – Population inversion, pumping - Einstein's A and B coefficients – derivation – Types of lasers – He-Ne, CO_2, Nd-YAG, Semiconductor lasers homojunction and heterojunction (Qualitative) - Industrial Applications – Lasers in welding, heat treatment, cutting – Medical applications – Holography (construction and reconstruction).

UNIT III FIBRE OPTICS AND APPLICATIONS 12

Principle and propagation of light in optical fibres – Numerical aperture and Acceptance angle – Types of optical fibres (material, refractive index, mode) – fibre manufacturing (Double crucible technique) – Splicing, Loss in optical fibre – attenuation, dispersion, bending – Fibre optical communication system (Block diagram) – Light sources – Detectors –PIN Photo diode- Fibre optic sensors – temperature and displacement – Endoscope.

UNIT IV QUANTUM PHYSICS 12

Black body radiation – Planck's radiation law (derivation) – Deduction of Wien's displacement law and Rayleigh – Jeans Law from Planck's theory – Compton effect – Theory and experimental verification – Matter waves – Schrödinger's wave equation – Time independent and time dependent equations – Physical significance of wave function – Particle in a one dimensional box – Electron microscope - Scanning electron microscope – Transmission electron microscope.

UNIT V CRYSTAL PHYSICS 12

Lattice – Unit cell – Bravais lattice – Lattice planes – Miller indices – d spacing in cubic lattice – Calculation of number of atoms per unit cell – Atomic radius – Coordination number – Packing factor for SC, BCC, FCC and HCP structures – NaCl, ZnS, diamond and graphite structures – Polymorphism and allotropy – Crystal defects – point, line and surface defects – Burger vector.

TOTAL: 60 hours

TEXT BOOKS:

1. Gaur, R. K. and Gupta, S.C., 'Engineering Physics' Dhanpat Rai Publications, New Delhi 2013.
2. Avadhanulu, M.N. and Kshirsagar, P.G., 'A Text book of Engineering Physics', S.Chand and Company, Ltd., New Delhi, 2013.

REFERENCE BOOKS:

1. Frank J.Faly, "Foundations of Engineering Accoustics", Elsevier Academic press, 2005.
2. Williams T.Silfrast, "Laser Fundamentals", Cambridge University press, 2004.
3. John Gowar, "Optical communication systems", Prentice Hall publications, 1993.
4. Murugesan R and Sivaprasath K, Modern Physics, S. Chand Ltd., 2008.

15GBE003 FUNDAMENTALS OF COMPUTING 3 1 0 3

COURSE OBJECTIVE:

To provide a comprehensive study of the C programming language. It stresses the strengths of C, which provide students with the means of writing efficient, maintainable, and portable code.To emphasize the nature of C language in the wide variety of examples and applications.To learn and acquire art of computer programming. To know about some popular programming language for solving a problem

COURSE OUTCOME:

CO-1: Able to choose appropriate data structure as applied to specified problem definition..

CO-2: Clearly be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

CO- 3: Apply concepts learned in various domains like DBMS, compiler construction etc.

CO- 4: Able to use linear and non-linear data structures like stacks, queues, linked list etc.

CO -5: Understand about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

CO- 6: Acquire knowledge of tree and graphs concepts.

CO- 7: Understand concepts about searching and sorting techniques

UNIT I INTRODUCTION TO COMPUTERS 12

Introduction – Characteristics, Classification and Evolution of Computers – Computer Generations: zero, first, second, third, fourth generation – Basic Computer organization – Number Systems : Decimal, Binary, Hexadecimal, Octal numbers – Computer Software – Types of Software – Software Development Steps.

UNIT II PROBLEM SOLVING AND OFFICE APPLICATION SOFTWARE 12

Planning the Computer Program – Purpose – Algorithm – Flow Charts – Pseudocode – Application Software Packages : shareware, freeware, open source software, application software for individual use-Introduction to

Office Packages: word processing, spreadsheets– Internet basics: Internet evolution, Html tags- Forms- Frames.

UNIT III INTRODUCTION TO C 12

Overview of C: Constants, Variables, Keywords, Data Types – Compilation and Execution – Input and Output functions – Operators – C Instructions – Control Instructions : Decision control structure, Loop Control structure, Case Control Structure.

UNIT IV FUNCTIONS AND POINTERS 12

Functions: Library functions, User defined functions, call by value, call by reference, recursive functions – Pointers – Arrays: one dimensional array, multi-dimensional array, arrays using pointers , passing arrays to functions– Strings: library string functions – pointers in strings-pointers and function arguments.

UNIT V STRUCTURES AND FILES 12

Structures: assigning values to structure elements, structure containing pointers – Unions – Storage classes: auto, static, extern, register – Dynamic memory allocation – Files: file Operations, processing a file, Preprocessor directives– use of type def – Command line arguments- Enumerated data types.

TOTAL: 60 hours

TEXT BOOKS:

1. Yashavant Kanetkar, “Let Us C”, BPB Publications, Thirteenth Edition 2013.
2. Balagurusamy, E., “Computing fundamentals and C Programming”, Tata McGraw-Hill Publishing Company Limited, 2010.
3. Thomno A. Powell, “The Complete Reference HTML and CSS”, fifth edition, Tata McGrawHill,2010

REFERENCE BOOKS:

1. Ashok.N.Kamthane, “Computer Programming”, Pearson Education (India) 2009.

15GBE004 ENGINEERING GRAPHICS 2 0 3 4

COURSE OBJECTIVE:

To understand importance of dimensioning in large scale drawings used as design initiation in manufacturing. To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.To expose them to existing national standards related to technical drawings.To understand the topics like first angle and third angle projections, isometric projections, orthographic projections of points, lines and solids.

COURSE OUTCOME:

CO-1: Understand the theory of projection.

CO-2: Know and understand the conventions and the methods of engineering drawing.

CO-3: Improve their visualization skills so that they can apply these skills in developing

CO-4: Able to prepare the simple layout of factory buildings.

CO-5: Impart and inculcate a proper understanding of the theory of projection.

CO-6: Understand the various concepts like dimensioning and standards related to working drawings in order to become professionally efficient.

CO-7: Impart the knowledge for understanding and drawing of simple residential/office buildings and ability to convert sketches into engineered drawings

UNIT I PLANE CURVES AND FREE HAND SKETCHING 12

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction ofellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction ofinvolutes of square and circle – Drawing of tangents and normal to the above curves, Scales:Construction of Diagonal and Vernier scales.Visualization concepts and Free Hand sketching: Visualization principles –Representation of ThreeDimensional objects – Layout of views- Free hand sketching of multiple views from pictorial views ofobjects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 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 ofplanes (polygonal and circular surfaces) inclined to both the principal planes by rotating objectmethod.

UNIT III PROJECTION OF SOLIDS 12

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

UNIT IV PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OFSURFACES 12

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

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 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 and miscellaneous problems. Perspective projection of simple solids-Prisms,pyramids and cylinders by visual ray method. COMPUTER AIDED DRAFTING **(**Demonstration Only**).**Introduction to drafting packages and demonstration of their use.

TOTAL: 60 hours

TEXT BOOK:

1. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010

REFERENCE BOOKS:

1. Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. 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.
3. Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2nd Edition, 2009.
4. Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New AgeInternational (P) Limited, 2008.
5. Natrajan K.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2009.
6. BasantAgarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing CompanyLimited, New Delhi, 2008.

Publication of Bureau of Indian Standards:

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

Special points applicable to University Examinations on Engineering Graphics:

1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. Thestudents will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

15GBE005 ENGINEERING PRACTICES LAB 0 0 3 2

GROUP A – MECHANICAL AND CIVIL ENGINEERING PRACTICES

MECHANICAL ENGINEERING PRACTICES

COURSE OBJECTIVE:

To study bench fitting drawings for making male and female fittings as per the given dimensions and Tolerances.To study Arc welding drawings for making common weld joints as per the given dimensions.To study sheet metal development drawings for making common metal parts/components as per the given dimensions.

COURSE OUTCOME:

CO-1: Plumbing tools – house hold plumbing fittings and Carpentry process – Carpentry tools, types of joints.

CO-2: Types of welding & tools.

CO-3: To know about Pipe line drawings for making common water supply in the domestic, plant applications as per the given dimensions

LIST OF EXPERIMENTS

1. To make square, hexagonal, V joint in bench fitting as per the given dimensions and Tolerances.
2. To make single V, butt, lap and T fillet joint by arc welding with the back hand and fore hand welding techniques as per the given dimensions.
3. To make simple Cubical blocks, Rectangular trays in sheet metal with the jigs as per the given dimensions.

CIVIL ENGINEERING PRACTICES

COURSE OBJECTIVE:

To study Wood working drawings for making common wooden joints as per the given dimensions. To study Pipe line drawings for making common water supply in the domestic, plant applications as per the given dimensions.

COURSE OUTCOME:

CO-1: Clearly understand the making, cutting and bending of sheet metals to desired shape.

CO-2: Analyze plumbing and carpentry components of residential and industrial buildings.

CO-3: Understand the lap and butt joint on the work pieces using welding.

CO-4: Well versed in boring, drilling, tapping, turning, facing, threading, polishing, grooving etc..in lathe works.

CO-5: Familiarize with metal works, carpentry works, lathe works, plumbing works, welding works for all kind of buildings

LIST OF EXPERIMENTS

1. To make simple T, cross lap, mortise- tenon joints by wooden blocks as per the given dimensions.
2. To make simple water line pipe connections in PVC pipes with single tap, double taps for same and different diameters with valves as per the given dimensions.

GROUP B – ELECTRICAL AND ELECTRONICS ENGINEERING PRACTICES

ELECTRICAL ENGINEERING PRACTICES

COURSE OBJECTIVE:

To read electrical drawings for making Residential and industrial wiring as per the given provisions.To read electrical circuit drawings for measuring electrical quantities, energy for the given electrical circuit.

COURSE OUTCOME:

CO-1: Able to measure energy by using single phase energy meter.

CO-2: Can measure electrical quantities like voltage, current, power, power factor in Electrical Circuit.

CO-3: Skill to do fluorescent lamp, stair case and residential wiring

CO-4: Can measure Peak-peak, RMS, Time Period, Frequency using CRO.

CO-5: Ability to solder components devices and circuits by using general purpose PCB.

.**LIST OF EXPERIMENTS:**

1. To measure energy by using single phase energy meter.
2. To measure electrical quantities like voltage, current, power, power factor in RLC Circuit..
3. To make fluorescent lamp, stair case and residential wiring.

ELECTRONICS ENGINEERING PRACTICES

COURSE OBJECTIVE:

To understand the colour coding of the Resistors.To measure AC Signal parameters by the CRO. To measure ripple factors of HWR, FWR.To solder and de-solder the components in the PCB.

LIST OF EXPERIMENTS

1. To measure Peak-peak, rms, period, frequency using CRO.
2. To solder components devices and circuits by using general purpose PCB.

SUGGESTED ACTIVITIES

1. To attempt application oriented mini projects with the skills obtained for all the practices.
2. To make picture charts for all the practices.

TOTAL: 45 hours

REFERENCE BOOKS:

1. Engineering practices lab manual – S.Madhavan / S.Achudhan (United Global Publishers).
2. Engineering practices lab manual – V. Ramesh Babu (VRB Publishers).

15GBE006 ENGINEERING PHYSICS LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics and properties of matter. To provide a clear understanding of the working principles of lasers and semiconductor devices for performing their functions.

COURSE OUTCOME:

CO-1: Determine and measure the various physical parameters in the areas of optics, mechanics and properties of matter

CO-2: Evaluate the experimental procedures, processes and results.

CO-3 Apply the principle to new applications.

CO-4: Analyze the various experiments in the areas of optics and properties of matter will nurture the students in all branches of Engineering.

CO-5: Analyze the physical principle involved in the various instruments; also relate the principle to new application.

CO-6: Apply the knowledge of mathematics, science and engineering fundamentals

CO-7: Design and conduct experiments and interpret the experimental results.

CO-8: Develop the innovative ideas and also improve the creative skills that are essential for engineering.

LIST OF EXPERIMENTS

1. Determination of Young's modulus of the material – Non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer – Dispersive power of a prism.
6. Determination of Young's modulus of the material – Uniform bending.
7. Torsional Pendulum – Determination of Rigidity modulus.
8. Ultrasonic Interferometer – Velocity of ultrasonic waves and compressibility of liquids.
9. Spectrometer – Grating – Wavelength of mercury spectrum.
10. Determination of wavelength of LASER and particle size using Grating.
11. Determine the wavelength of given source using the newton's ring experiment
12. Find the thickness of the given thin wire using air wedge method

TOTAL: 45 hours

15GBE007 COMPUTER PRACTICE LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To be familiar with the use of Office software.To expose the presentation and visualization tools. To be exposed to problem solving techniques and flow charts. To familiar with programming in C. To learn the use Arrays, strings, functions, structures and unions.

COURSE OUTCOME:

CO-1: Able to Search, generates, manipulate data using MS office/ Open Office

CO- 2: Expose to Presentation and Visualization – graphs, charts, 2D, 3D.

CO-3: Familiar with C Programming using Simple statements and expressions.

CO-4: Learn how to utilize decision making and looping statements available in C for problem solving.

CO-5: Apply the concept of array and string manipulation to implement sorting and searching.

CO -6: Develop simple applications using structure and union.

CO-7: Analyze problems, and designing and implementing algorithmic solutions.

CO-8: Learn implementation of pointers using c programming.

CO-9: Learn to read and write the files.

CO-10: Learn HTML tags and create webpage.

A) WORD PROCESSING

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart.

B) SPREAD SHEET

1. Chart - Line, XY, Bar and Pie.
2. Formula - formula editor.
3. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
4. Sorting and Import / Export features.

C) POWERPOINT

1. Any presentation of minimum five slides.

D) SIMPLE C PROGRAMMING *

1. Data types, Expression Evaluation, Condition Statements.
2. Arrays.
3. Structures and Unions.
4. Functions and Pointers.
5. File Operations.

- For programming exercises Flow chart and pseudocode are essential

E) HTML PROGRAMMING*

1. Create a webpage to embed an image in that page using HTML tags.
2. HTML program for Table creation.

TOTAL: 45 hours

15GBE202	**COMMUNICATION SKILLS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVE:

To help students develop communication skills in a professional context. To help students acquire the ability to speak effectively in English in real life situations. To inculcate reading habit and to develop effective reading skills. To enable the students obtain technical vocabulary. To enable the students to compete for an engineering or technical career. To enable students develop the skills of technical writing in formal a business situations.

COURSE OUTCOME:

CO-1: Empower their listening expertise so they might value its part in the LSRW aptitudes way to deal with dialect and enhance their articulation

CO-2: Furnish understudies with vital preparing in listening so that can appreciate the discourse of individuals of various foundations and areas.

CO-3: Understand mindful of the part of talking in English and its commitment to their prosperity.

CO-4: Empower understudies to convey what needs be fluidly and suitably in social and expert connections and oral hone.

CO-5: Describing objects/circumstances/individuals.

CO-6: Role play – Individual/Group exercises (Using practices from all the nine units of the endorsed content.

CO-7: Just a Minute (JAM) Sessions.

CO-8: Add to mindfulness in the understudies about the essentialness of noiseless perusing and perception.

CO-9: Add to the capacity of understudies to figure the implications of words from connection and handle the general message of the content, draw surmising and so forth.

CO-10: Add to mindfulness in the understudies about composing as an accurate and formal ability and to outfit them with the parts of various types of composing, starting with the lower request ones.

UNIT I TECHNICAL VOCABULARY 9

Technical Vocabulary, Punctuation, Numerical Expressions, Expanding Acronyms and Abbreviations, Concord, 'If' clauses, Infinitives. Homonyms, Homographs and Homophones, Telephone conversations, Reading Comprehensions, Making of an advertisement.

UNIT II BASIC SKILL – READING AND SPEAKING SKILL 9

Reading and interpretation, , Intensive reading,. Writing reviews on books and films, Descriptions, Process description, Summarizing, Instructions, Oral presentations. Debate.

UNIT IV BASIC SKILL – TECHNICAL WRITING SKILL 9

Letters – formal, informal, Cover Letter and CV , Synonyms and Antonyms, Indefinite Adjectives, Non-verbal communication, Interactive sessions. Role Plays, Critical reading
Listening and Note taking.

UNIT IV BASIC SKILL – LISTENING AND SPEAKING SKILL 9

Active and Passive Voice, Impersonal Passive, Essay Writing, Comprehension Passage, Editing, Correction of errors, Direct and Indirect, Conversations , Dialogue writing, Discourse Markers. Group activities.

UNIT V TECHNICAL WRITING AND COMMUNICATION 9

Reports – Types, structure, data collection, content, form, Definitions, extended definition, Recommendations, Memos, Checklists. Group Discussions, Listening and comprehending the conversations.

TOTAL: 45 hours

TEXT BOOKS:

1. Department of English, Anna University, Mindscapes, 'English for Technologists and Engineers', Orient Longman Pvt. Ltd, Chennai: 2012.
2. Department of Humanities and Social Sciences, Anna University, ''English for Engineers and Technologists'' Combined Edition (Volumes 1 and 2), Chennai: Orient Longman Pvt. Ltd., 2006.
3. M.Ashraf Rizvi, "Effective Technical Communication",Tata mcGraw-Hill Publishing Company Limited, New Delhi.2009.

REFERENCE BOOKS:

1. Sumant. S, 'Technical English', Second Edition, McGraw-Hill Education (India) Pvt. Ltd., 2008.
2. Dr. M. Hariprasad," Communicative English "Third Edition, Neelkamal Publications, PVT. LTD.,2007.
3. Sangeeta Sharma , Binod Mishra, 'Communication Skills for Engineers and Scientists, PHI Learning Private Limited., New Delhi, 2009.

15GBE008 MATHEMATICS-II 3 1 0 3

COURSE OBJECTIVE:

To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems. To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines. To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

COURSE OUTCOME:

CO- 1: To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

CO- 2: To have an ability of mathematical modeling of systems using differential equations and ability to solve the differential equations.

CO- 3: To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.

CO- 4: To use Stokes' theorem, Green's theorem and Gauss divergence an to give a physical interpretation of the curl of a vector field.

CO- 5: To introduce the basics of analytic functions and the basics in complex integration this is used to evaluate complicated real integrals.

CO- 6: Evaluate real and complex integrals using the Cauchy integral formula and the residue Theorem.

CO- 7: To use shift theorems to compute the Laplace transform, inverse Laplace transform and the solutions of second order, linear equations with constant coefficients.

CO- 8: To introduce the concepts of Laplace Transforms and its applications to various problems related to engineering and technology.

CO- 9: To be able to find time responses of linear systems using Laplace transforms.

CO-10: To apply partial fraction expansion to simplify a transform function for inverse Laplace transformation.

CO- 11: To apply Laplace Transform methods to solve initial value problems for constant coefficient linear ODEs.

UNIT I ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy's and Legendre's linear equations – Simultaneous first order linear equations with constant coefficients.

UNIT II VECTOR CALCULUS 12

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and stoke's theorem (excluding proofs) – Simple applications involving cubes and rectangular parallel pipes.

UNIT III ANALYTIC FUNCTIONS 12

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping : w= z+c, cz, 1/z, and bilinear transformation.

UNIT IV COMPLEX INTEGRATION 12

Complex integration – Statement and applications of Cauchy's integral theorem and Cauchy's integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

UNIT V LAPLACE TRANSFORM 12

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

TOTAL: 60 hours

TEXT BOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications ,Delhi,43rd Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,6th reprint, 2008.

REFERENCE BOOKS:

1. Erwin Kreyszig, “Advanced Engineering Mathematics”, Wiley India, 9th Edition, 2011.
2. Glyn James, “Advanced Modern Engineering Mathematics”,Pearson Education ,3rd Edition, 2012.
3. Jain R.K and Iyengar S.R.K, “Advanced Engineering Mathematics”, Narosa Publishing House , 4th Edition,2014

15GBE009 ENGINEERING CHEMISTRY 3 1 0 3

COURSE OBJECTIVE:

To make the students conversant with boiler feed water requirements, related problems and water treatment techniques. To understand the principles of electrochemical reactions, redox reactions in corrosion of materials and methods for corrosion prevention and protection of materials. Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells. To understand the preparation, properties and applications of engineering materials.To study the types of fuels, calorific value calculations, manufacture of solid, liquid.

COURSE OUTCOME:

CO-1: Know about characteristics of water and estimation of hardness using EDTA Titration
CO-2: Determine alkalinity and its types of alkalinity using neutralisation reaction
CO-3: Explain different types of Nuclear reactions, stability of Nucleus and Nuclear forces
CO-4: Distinguish between Daniel cell, Voltaic cell, batteries etc.
CO-5: Define refractoriness, abrasives, lubricants and its classifications.
CO-6: .Define polymers, Classifications of polymers and its synthetic applications.
CO-7: Distinguish between Chemical and Electrochemical Corrosion and method of prevention
CO-8: Gain knowledge about different sources of energy and types of batteries
CO-9: Understand the method of synthesis and different types of Nano tubes and its application

UNIT I WATER TECHNOLOGY 12

Characteristics – alkalinity – types of alkalinity and determination – hardness – types of estimation by EDTA method (problem) – Domestic water treatment – disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning – de mineralization process – desalination and reverse osmosis

UNIT II ELECTROCHEMISTRY, NUCLEAR CHEMISTRY AND NANO CHEMISTRY 12

Introduction -Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of Ph, Nuclear energy – fission and fusion reactions and light water nuclear reactor for power generator (block diagram only) – Breeder reactor. Nanomaterials – introduction to nanochemistry – carbon nanotubes and their applications.

UNIT III ENGINEERING MATERIALS 12

Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks and their applications. Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide. Lubricants – mechanism of lubrications – properties – viscosity index – flash and fire points, cloud and pour points – oiliness – solid lubricants – graphite and molybdenum di sulphide.

UNIT IV POLYMERS AND COMPOSITES 12

Polymers – definition – polymerization – types – addition and condensation polymerization –free radical polymerization and mechanism – Plastics, classification – preparation, properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET – Rubber – vulcanization of rubber. Synthetic rubbers. Composites – definition, types, polymer matrix composites – FRP only. Conducting polymers, semiconducting polymers, molecular switches—examples, mechanism and applications.

UNIT V CORROSION, CORROSION CONTROL AND STORAGE DEVICES 12

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

Solar energy conversion – solar cells – wind energy – fuel cells –hydrogen – oxygen fuel cell – Batteries – alkaline batteries – lead – acid batteries – nickel – cadmium batteries and lithium batteries.

TOTAL: 60 hours

TEXT BOOKS:

1. B.Sivasankar “Engineering Chemistry” Tata McGraw-Hill Pub.Co.Ltd, New Delhi 2008.
2. B.K.Sharma “Engineering Chemistry” Krishna Prakasan Media (P) Ltd., Meerut 2001.
3. Puri and Sharma “A text book of Physical chemistry “, Chand and Co., New Delhi

REFERENCE BOOKS:

1. Jain P.C. and Monica Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010
2. Dara S.S, Umare S.S, “Engineering Chemistry”, S. Chand & Company Ltd., New Delhi 2010

15GBE010 MATERIALS SCIENCE 3 0 0 3

COURSE OBJECTIVE:

The students will have knowledge on the basics of physics related conducting materials, semiconducting materials, magnetic super conducting materials, dielectric materials and modern engineering materials etc and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

COURSE OUTCOME:

CO- 1: Discuss the classical free electron theories of conducting materials.

CO- 2: Explain the theoretical aspects of semiconducting materials and illustrate the correct and efficient ways of solving problems.

CO- 3: Compare the types of magnetic and superconducting materials and their applications.

CO- 4: Discuss the various types of polarization mechanisms in dielectrics and illustrate the applications of dielectric materials.

CO- 5: Identify new engineering materials for design and construction.

CO- 6: Develop the applications of prepared advanced engineering materials.

CO- 7: Understand the contemporary issues relevant to Materials Science and Engineering.

CO- 8: Apply general mathematics, science and engineering skills to the solution of engineering probl9ms.

CO- 10: Apply core concepts in Materials Science to solve engineering problems.

CO- 11: Use the techniques, skills and modern engineering tools necessary for engineering practice.

UNIT I CONDUCTING MATERIALS 9

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Drawbacks of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

UNIT II SEMICONDUCTING MATERIALS 9

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives. Superconductivity: properties – Types of superconductors – BCS theory of superconductivity(Qualitative) – High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

UNIT IV DIELECTRIC MATERIALS 9

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarisation – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

UNIT V MODERN ENGINEERING 9

Metallic glasses: preparation, properties and applications-Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA.Nanomaterials: synthesis –

plasma arcing – chemical vapour deposition – sol-gels – electro deposition – ball milling – properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition.

TOTAL: 45 hours

TEXT BOOKS:

1. Rajendran, V, and Marikani A, 'Materials Science' Tata McGraw Hill publications, New Delhi 2004.
2. Vijaya, M. and Rangarajan G, 'Materials Science' Tata McGraw Hill publications, New Delhi 2004.

REFERENCE BOOKS:

1. Jayakumar, S. 'Materials Science', R.K. Publishers, Coimbatore, 2008.
2. Palanisamy P.K, 'Materials Science', Scitech publications, Chennai, 2007.
3. Charles P. Poole and Frank J.Owen, 'Introduction to Nanotechnology', Wiley India 2007.
4. Charles Kittel 'Introduction to Solid State Physics', John Wiley and sons, 7th edition, Singapore 2007.

15EEE021 CIRCUIT THEORY 3 1 0 3

COURSE OBJECTIVE:

To introduce electric circuits and its analysis,To impart knowledge on solving circuits using network theorem. To introduce the phenomenon of resonance in coupled circuits, To educate on obtaining the transient response of circuits & To Phasor diagrams and analysis of three phase circuits

COURSE OUTCOME:

CO-1: Analyze circuit systems using direct application of Kirchhoff's Current and Voltage Laws along with Ohm's Law.

CO- 2: Interpret analytical circuit results to properly assign power, current, and voltage values to circuit graphical representations

CO- 3: Pertain mesh-current analysis techniques to analyze circuit behavior.

CO -4: Relate node-voltage analysis techniques to analyze circuit behavior

CO- 5: Explain the characteristics of capacitor, inductor, and transformer circuit elements.

CO -6: Calculate initial conditions for current and voltage in first order R-L and R-C capacitor and inductor circuits.

CO- 7: Work out time response of current and voltage in first order R-L and R-C capacitor and inductor circuits.

CO -8: Compute initial conditions for current and voltage in second order RLC circuits

CO -9: Figure time response of current and voltage in second order RLC circuits.

CO- 10: Introduction to sinusoidal steady state

CO- 11: Design and analysis of RLC circuits using phasor techniques

CO- 12: Compute time response of current and voltage in second order RLC circuits.

UNIT I BASIC CIRCUITS 12

System of Units-Electrical Quantities-Circuit elements-Independent and Dependent Sources-Ohm's Law-Kirchhoff's Laws-Analysis of Circuits using Kirchhoff's Laws-Wye↔Delta Transformation-Mesh and Nodal analysis.

UNIT II AC CIRCUITS 12

Introduction to Time Varying and Alternating Quantities – Average and RMS(effective)values –Form Factor-Phasor Relationships for Circuit Elements – Steady Sate Solution using Phasor algebra –3-phase circuits – active power, reactive power, apparent power and power factor – power triangle.

UNIT III NETWORK REDUCTION AND NETWORK THEOREMS 12

Network reduction: voltage and current division, source transformation. Thevenin's Theorem: Norton's Theorem: Superposition Theorem: Maximum power transfer Theorem: Reciprocity Theorem.

UNIT IV RESONANCE AND COUPLED CIRCUITS 12

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

UNIT V TRANSIENT RESPONSE FOR DC CIRCUITS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

TOTAL: 60 hours

TEXT BOOKS:

1. Navhi M and Edminister J A, "Theory and Problems of Electric Circuit",Tata McGraw-Hill Publishing company Limited, New Delhi, Fourth Edition, 2007
2. Sudhakar A and Shyammohan S palli, "Circuits and Networks – Analysis and Synthesis", Tata McGraw-Hill Publishing company Limited, New Delhi, Third Edition, 2007.

REFERENCE BOOKS:

1. Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi, 1996.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Tata McGraw-Hill, New Delhi, 2001.
3. Charles K. Alexander, Mathew N.O. Sadik, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2003.

15EEE___ BASIC CIVIL AND MECHANICAL ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

To impart basic knowledge on Civil and Mechanical Engineering. To explain the materials used for the construction of civilized structures. To make the understand the fundamentals of construction of structure. To explain the component of power plant units and detailed explanation to IC engines their working principles. To explain the refrigeration and air conditioning system

COURSE OUTCOME:

CO1: Explain the technical terminologies related to construction and mechanical sciences.

CO2: Disseminate with various components, equipments and technical standards

CO3: Know the principle, procedures, and the materials

CO4: Be aware of the uses and standards adopted in industries.

CO5: Understand the procedures for construction of several structures.

CO6: Create working models or prototypes of the components.

CO7: Gain knowledge in surveying, their types and the equipments used.

CO8: Explain the principle, working and application of Engines and Power plants.

CO9: Explain the principle, working and application of Internal Combustion Engines.

CO10: Explain the principle, working and application of refrigeration and air conditioning system.

A – CIVIL ENGINEERING

UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 9

Surveying: Objects – Types – Classification – Principles– Measurement of distances – Angles – Leveling – Determination of area. Civil Engineering Materials: Bricks – Stones – Sand – Cement – Concrete – Steel sections.

UNIT II BUILDING COMPONENTS AND STRUCTURES 9

Foundations: Types – Definition of Bearing capacity – Requirements of good foundation. Superstructure: Masonry – Types – Beams – Columns – Lintels – Roofing – Flooring – Plastering – Stress – Strain – Elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

B – MECHANICAL ENGINEERING

UNIT III POWER PLANT ENGINEERING 9

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

UNIT IV I C ENGINES 9

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 9

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

TOTAL: 45 hours

TEXT BOOKS:

1.Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.

2.Ramamrutham. S, “Basic Civil Engineering”, DhanpatRai Publishing Co. (P) Ltd. 1999.

REFERENCE BOOK:

1.Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

15GBE011 ENGINEERING CHEMISTRY LABORATORY 0 0 3 2

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Estimate different types of hardness of water using complexometric titrations of given water sample

CO-2: Determine the amount of alkalinity of the given water sample using standard NaOH.

CO-3: Find out the amount of chloride ion present in the given solution using argentometric method

CO-4: Calculate the molecular weight of unknown polymer solution using viscosity method

CO-5: Determine the amount of strong acid present in the given mixture of acid solution using conductometric titrations

CO-6: Estimate the amount of strong and weak acid present in the mixture solution using conductometric titrations

CO-7: Estimate the amount of barium chloride present in the given solutions using conductometric titrations

CO-8: Estimate the amount of ferrous ion present in the given solution using conductometric titrations

CO-9: Determine the strength of the given acid by using PH-metry titrations

LIST OF EXPERIMENTS

1. Determine the total, permanent and temporary hardness of the given water sample by EDTA method. A standard hard water and EDTA solutions are provided.

2. Determine the type and amount of alkalinity present in the given water sample. A standard solution of sodium hydroxide of strength 0.1N is given.

3. Estimate the amount of chloride present in the water sample by Argentometric analysis. A standard solution of strength 0.01N and sodium chloride solutions are provided

4. Determination of molecular weight of given polymer solution by Ostwald viscometer method.

5. Determine the amount of strong acid and weak acid (HCl and CH_3COOH) present in 1 litre of the given mixture of acid solution by conductometric titration using standard NaOH of normality 0.2N.

6. Determine the amount of barium chloride present in 1 litre of the given solution by conductometric titration using standard solution of sodium sulphate of normality 0.2N.

7. Estimate the amount of ferrous ion present in the whole of the given solution. A standard solution of potassium dichromate of strength 0.1N is provided

.8. Determine the strength of the given hydrochloric acid by pH-metry with 0.2N sodium hydroxide solution.

TOTAL: 45 hours

15GBE203 LANGUAGE LABORATORY 0 0 3 2

COURSE OBJECTIVES:

To equip students of engineering and technology with effective speaking and listening skills in English. To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

COURSE OUTCOME:

CO-1: Write National and International examinations such as IELTS, TOEFL and Civil services (Verbal Ability) confidently.

CO-2: Use appropriate communication strategies for enhancing interpersonal relationship.

CO-3: Apply soft skills in personal, social and corporate life

CO-4: Articulate knowledge of chosen profession and corporate skills effectively in interviews with appropriate body language.

CO-5: Demonstrate active group discussion and presentation skills such as initiating a conversation, exchanging ideas, expressing dissent or agreement and giving persuasive presentation.

CO-6: Prepare job applications, various letters, abstract and summary for technical articles

A. ENGLISH LANGUAGE LAB

I. PC based session (Weightage 40%) 24 periods

1. LISTENING COMPREHENSION 6

Listening and typing – Listening and sequencing of sentences – Filling in the blanks Listening and answering questions.

2. READING COMPREHENSION 6

Filling in the blanks – Close exercises – Vocabulary building – Reading and answering Questions.

3. SPEAKING 6

Phonetics: Intonation – Ear training – Correct Pronunciation – Sound recognition exercises Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation – Role play activities Students take on roles and engage in conversation.

B. DISCUSSION OF AUDIO – VISUAL MATERIALS
(Samples are available to learn and practice)

1. RESUME / REPORT PREPARATION / LETTER WRITING **1**

Structuring the resume / report – Letter writing / Email Communication – Samples.

2. PRESENTATION SKILLS **1**

Elements of effective presentation – Structure of presentation – Presentation tools – Voice Modulation – Audience analysis – Body language – Video samples

3. SOFT SKILLS **2**

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and creativity –Stress Management & Poise – Video Samples

4. GROUP DISCUSSION **1**

Why is GD part of selection process? – Structure of GD – Moderator – led and other GDs – Strategies in GD – Team work – Body Language – Mock GD –Video samples.

5. INTERVIEW SKILLS **1**

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews– Video samples.

1. Resume / Report Preparation / Letter writing: Students prepare their (2) own resume and report.
2. Presentation Skills: Students make presentations on given topics.
3. Group Discussion: Students participate in group discussions.
4. Interview Skills: Students participate in Mock Interviews .

II. Practice Session (Weightage – 60%)

TOTAL: 24 hours

TEXT BOOKS:

1. Anderson, P.V, Technical Communication, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, Verbal and Non–Verbal Reasoning, Macmillan India Ltd., Second Edition, New Delhi, 2004.

REFERENCE BOOKS:

1. John Seely, The Oxford Guide to Writing and Speaking, Oxford University Press, New Delhi, 2004.
2. Evans, D, Decision maker, Cambridge University Press, 1997.
3. Thorpe, E, and Thorpe, S, COURSE OBJECTIVE English, Pearson Education, Second Edition, New Delhi, 2007.

4. Turton, N.D and Heaton, J.B, Dictionary of Common Errors, Addison Wesley Longman Ltd., Indian re print1998.

ELECTRIC CIRCUITS LABORATORY 0 0 3 2

15EEE023

COURSE OBJECTIVE:

To impart knowledge on solving circuits using network theorems. To introduce the phenomenon of resonance in coupled circuits. To educate on obtaining the transient response of circuits. To Phase or diagrams and analysis of three phase circuits

COURSE OUTCOME:

CO-1: Able to find out voltages at different nodes and current through any branch of the given circuit

CO-2: Able to find out voltage across the load, current through the load and hence calculate the power consumed by the load of any circuit using appropriate network theorem

CO-3: Use basic laboratory equipment and techniques to measure electrical quantities using laboratory test equipment such as multimeters, power supplies and oscilloscopes

CO-4: Able to analyze and design ac and dc circuits.

CO-5: Able to measure voltages and current, active, reactive powers of a circuit excited by three phase AC supply.

LIST OF EXPERIMENTS

1. Experimental verification of Kirchhoff's voltage and current laws
2. Experimental verification of network theorems (Thevenin, Norton, Superposition and maximum power transfer Theorem).
3. Study of CRO and measurement of sinusoidal voltage, frequency and power factor.
4. Experimental determination of time constant of series R-C electric circuits.
5. Experimental determination of frequency response of RLC circuits.
6. Design and Simulation of series resonance circuit.
7. Design and Simulation of parallel resonant circuits.
8. Simulation of low pass and high pass passive filters.
9. Experimental determination of power in three phase circuits by two-watt meter method .
10. Calibration of single phase energy meter.

TOTAL: 45 hours

15GBE204 ENVIRONMENTAL SCIENCE AND ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

To the study of nature and the facts about environment. To finding and implementing scientific, technological, economic and political solutions to Environmental problems. To study the interrelationship between living organism and environment. To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.

COURSE OUTCOME:

CO-1: Understand constitution of the environment and precious resources in the environment

CO-2: Understand and conserve the natural resources

CO-3: Understand the role of a humans in balancing a clean environment

CO-4: Explain how to maintain ecological balance and preserve biodiversity

CO-5: Understand the role of government and non – governmental organization in environmental managements

CO-6: Understand the importance of public awareness of the ecosystem and the role of an Individual in the conservation of natural resources and use of resources for sustainable lifestyles

CO-7: Understand the impact of air pollution, water pollution, soil pollution, marine pollution, noise pollution and thermal pollution

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND NATURAL RESOURCES 9

Definition, Scope and Importance – Need For Public Awareness – Forest Resources:- Use and Over - Exploitation, Deforestation, Case Studies, Timber Extraction, Mining, Dams and their Ground Water, Floods, Drought, Conflicts Over Water, Dams - Benefits and Problems – Mineral Resources:- Use 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 – Equitable use of Resources for Sustainable Lifestyles. Field Study of Local Area to Document Environmental assets – River/Forest/Grassland/Hill/ Mountain.

UNIT II ECOSYSTEMS AND BIODIVERSITY 9

Concepts of an Ecosystem – Structure and Function of an Ecosystem – Producers, Consumers and Decomposers – Energy Flow in the Ecosystem – Ecological Succession – Food Chains, Food Webs and Ecological Pyramids – Introduction, Types, Characteristic Features, Structure and Function of the (A) Forest Ecosystem (B) Grassland Ecosystem (C) Desert Ecosystem (D) Aquatic Ecosystems (Ponds, Streams, Lakes, Rivers, Oceans, Estuaries) – Introduction to Biodiversity – Definition: Genetic, Species and Ecosystem Diversity – Biogeographical Classification of India – Value of Biodiversity: Consumptive Use, Productive Use, Social, Ethical, Aesthetic and Option Values – Biodiversity at Global, National and Local Levels – India as a Mega-Diversity Nation – Hot-Spots of Biodiversity – Threats to Biodiversity: Habitat Loss, Poaching of Wildlife, Man-Wildlife Conflicts – endangered and Endemic Species of India – Conservation of Biodiversity: In-Situ and Ex-Situ conservation of Biodiversity. Field Study of Common Plants, Insects and Birds - Field Study of Simple Ecosystems – Pond, River, Hill Slopes, etc.

UNIT III ENVIRONMENTAL POLLUTION 9

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 – Soil Waste Management:- Causes, Effects and Control Measures of Urban and Industrial Wastes – Role of an Individual

in Prevention of Pollution – Pollution Case Studies – disaster Management:- Floods, Earthquake, Cyclone and Landslides.

Field Study of Local Polluted Site – Urban/Rural/Industrial/Agricultural

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

From Unsustainable To Sustainable Development – Urban Problems Related To energy – Water conservation, Rain Water Harvesting, Watershed Management – Resettlement and Rehabilitation of People, Its Problems and Concerns, Case Studies – Environmental Ethics:- Issues and Possible Solutions – Climate Change, Global Warming, Acid Rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust, Case Studies – Wasteland Reclamation – Consumerism and Waste Products – Environment Production Act – Air (Prevention and Control of Pollution) Act – Water (Prevention and Control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act – Issues Involved in enforcement of Environmental Legislation – Public Awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Population Growth, Variation Among Nations – Population Explosion – Family Welfare Programme – environment and Human Health – Human Rights – Value Education – HIV /AIDS – Women and Child Welfare – Role of Information Technology in Environment and Human Health – Case Studies

TOTAL: 45 h

TEXT BOOKS

1. Masters, G.M., "Introduction to Environmental Engineering and Science", Pearson Education Pvt., Ltd., 2nd Edition, 2004.
2. Miller, T.G. Jr., "Environmental Science", Wadsworth Pub. Co.
3. Townsend C., Harper, J. and Begon, M., "Essentials of Ecology", Blackwell Science, 2003.
4. Trivedi, R.K., and Goel, P.K., "Introduction to Air Pollution", Techno- Science Publications.

REFERENCE BOOKS

1. Erach, B., "The Biodiversity of India", Mapin Publishing Pvt. Ltd., Ahmedabad, India.
2. Trivedi, R.K., "Handbook of Environmental Law's, Rules, Guidelines,Compliances and Standards", Vol - I and II, Envio Media.
3. Cunningham., Cooper, W.P. and Gorhani, T.H., "Environmental Encyclopedia", Jaico Publishing House, Mumbai, 2001.
4. Wages, K.D., "Environmental Management", W.B. Saunders Co., Philadelphia, USA, 1998

15GBE012 MATHEMATICS-III 3 1 0 3

COURSE OBJECTIVE:

To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.To acquaint the student with Fourier transform techniques used in wide variety of situations.To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for

discrete time Systems. To know how to find Z – transform and Inverse Z – transform of certain functions and to solve difference equations using them.

COURSE OUTCOME:

CO- 1: To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems.

CO- 2: The Fourier series and its resulting Fourier analysis is used in electronics engineering to analyse waveforms and process them in a process known as digital signal processing (DSP).

CO- 3: To develop Fourier series for different types of functions.

CO- 4: To acquaint the student with Fourier transform techniques used in wide variety of situations.

CO- 5: Define and determine Fourier Transform.

CO- 6: Introduce students to how to solve linear Partial Differential with different methods.

CO- 7: Describe and implement the various standard methods for the solution of PDE.

CO- 8: The understanding of 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.

CO- 9: Derive and obtain the solution of wave, heat equation and boundary value problems.

CO- 10: Define Z -Transform and obtain the solution of difference equations.

CO- 11: To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z- transform techniques for discrete time systems

UNIT I FOURIER SERIES 12

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

UNIT II FOURIER TRANSFORM 12

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

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations - singular integrals- Solutions of standard types of first order partial differential equations – Lagrange's linear equation - Linear partial differential equations of second and higher order with constant coefficients of both homogeneous and non- homogeneous types.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification PDE-Method of separation of variables - Solutions of one dimensional wave equation – One dimensional equation of heat conduction – Steady state solution of two-dimensional heat equation (excluding Insulated edges)

UNIT V Z -TRANSFORM AND DIFFERENCE EQUATIONS 12

Z-transform - Elementary properties – Inverse Z-transform(using partial fraction and residues) – Convolution theorem - Formation of difference equations – Solution of difference equations using Z- transform.

TOTAL: 60 hours

TEXTBOOKS:

1. Grewal. B.S, "Higher Engineering Mathematics", Khanna Publications ,Delhi,43rd Edition, 2013.
2. Ramana B.V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company, New Delhi,6th reprint,2008.

REFERENCE BOOKS:

1.Bali.N.P. and Manish Goyal 'A Textbook of Engineering Mathematics', Laxmi Publications, 9th edition,2011.

2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition, 2011.
3. Glyn James, "Advanced Modern Engineering Mathematics", Pearson Education ,3rd Edition, 2012.
4. Sivaramakrishna Das.P & Vijayakumari.C ,A Text book of Engineering Mathematics-III (Transforms & Partial Differential equations), Pearson Eduaction Limited ,5th Edition ,2013.

15EEE031 ELECTRICAL MACHINES - 1 3 1 0 3

COURSE OBJECTIVE:

Provide the students a detailed knowledge regarding energy conversion processes(Mechanical Energy into Electrical Energy and vice versa) and Energy Balance Equation. Provide the students a detailed knowledge regarding electrical DC machines. Strengthening knowledge of students regarding the construction and working principle of DC machines which will help them in design field.

COURSE OUTCOME:

CO- 1: Understand the properties of magnetic materials and able to analyze magnetic circuits.
CO -2: Learn the basic principles of electromechanical energy conversion in singly and multiply excited systems.
CO -3: Learn basic fundamentals related to the operating principle, construction and working of a practical Transformer
CO -4 Able to calculate the losses, efficiency and voltage regulation of the transformers.
CO -5: Understand the working principles of electrical machines using the concepts of electromechanical energy conversion principles and derive expressions for generated voltage and torque developed in all Electrical Machines
CO- 6: Understand the working principles of DC machines as Generator and Motor, types, determination of their no- load/load characteristics, starting and methods of speed control of motors.
CO- 7: Estimate the various losses taking place in D.C. machines and to study the different testing methods to arrive at their performance.
CO -8: Understand the testing and application of DC machines

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 12

Magnetic circuits –Laws governing magnetic circuits - Flux linkage, Inductance and energy – Statically and Dynamically induced EMF - Torque – Properties of magnetic materials, Hysterisis and Eddy Current losses - AC excitation, introduction to permanent magnets-Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 12

Construction – principle of operation – equivalent circuit parameters – phasor diagrams, losses –testing – efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation –inrush current - three phase transformers-connections – Scott Connection – Phasing of transformer–parallel operation of three phase transformers-auto transformer – tap changing transformers- tertiary winding.

UNIT III ELECTROMECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 12

Energy in magnetic system – Field energy and coenergy-force and torque equations – singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magneticfields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 12

Construction and components of DC Machine – Principle of operation - Lap and wave windings-EMFequations– circuit model – armature reaction –methods of excitation-commutation and interpoles - compensating winding –characteristics of DC generators.

UNIT V DC MOTORS 12

Principle and operations - types of DC Motors – Speed Torque Characteristics of DC Motors-startingand speed control of DC motors –Plugging, dynamic and regenerative braking- testing and efficiency– Retardation test- Swinburne's test and Hopkinson's test - Permanent magnet dc motors(PMDC)-DCMotor applications.

TOTAL :60 hours

TEXT BOOKS:

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2010.
2. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.
3. Fitzgerald. A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, Tata McGraw Hill Books Company, 2003.

REFERENCE BOOKS:

1. P. C. Sen., 'Principles of Electrical Machines and Power Electronics', John Wiley & Sons, 1997.
2. Syed A. Nasar, Electric Machines and Power Systems: Volume I, Mcgraw-Hill College; International Edition, January 1995.
3. Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi, 2011.
4. P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
5. S.Sarma & K.Pathak "Electric Machines", Cengage Learning India (P) Ltd., Delhi, 2011.

15EEE032 ELECTRICAL MACHINES -I LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To have knowledge about the working of various types of motors using loads. To understand the operation of transformer with and without applying load and determine its efficiency. To gain knowledge in the operation of three phase transformer. To perform hopkin's and sumpner's test to determine the efficiency of the motor.

COURSE OUTCOME:

CO- 1: Able to find out the performance characteristics of DC Motor and Generator
CO- 2: Identify with the different techniques for the speed control of an DC Motor
CO- 3: Able to determine the efficiency of the DC Machine as motor using Hopkinson's Test
CO- 4: Able to understand the principle of electrical braking of DC Shunt motor
CO- 5: Able to determine transformer efficiency, voltage regulation, heating under loaded conditions and losses by conducting various tests.

LIST OF EXPERIMENTS

1. Load Characteristics of DC Shunt and Compound Generator
2. Load Characteristics of DC Shunt and Compound Motor
3. Load Test on DC series motor
4. Hopkinson's Test
5. Electrical Braking of DC Shunt motor
6. Load Test on 1-Phase Transformer
7. Open circuit and Short circuit Tests on 1-phase Transformer
8. Separation of no load losses in a 1-phase Transformer
9. Sumpner's Test on 1-Phase Transformers.
10. 3-Phase Transformer Connections **TOTAL: 45 hours**

15EEE033 ELECTRONIC CIRCUITS AND DIGITAL LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To have hands on experience with operation of low power semiconductor devices. To have experience in building the electronic circuits. To have knowledge in troubleshooting electronic circuits. To design simple and low power electronic circuit

COURSE OUTCOME:

CO-1: Verify the working of diodes and transistors.

CO-2: Set up a bias point in a transistor.

CO-3: Build a common emitter/base/collector amplifier and measure its voltage gain.

CO-4: Learn to design different types of filters and apply the same to oscillators and amplifiers.

CO-5: Able to design, simulate and implement basic combinational and sequential logic circuits.

CO-6: Able to implement adder and subtractor circuits.

CO-7: Will be familiar with the different code converter circuits.

CO-8: Able to apply Multiplexer and Demultiplexer circuits in various digital applications.

LIST OF EXPERIMENTS:

1. V I characteristics of PN junction diode and zener diode.
2. Design and construction of CB,CE and cc amplifier.
3. Response of low pass and high pass RC circuits for pulse and square input signals
4. Design of series voltage regulator
5. Design of RC coupled amplifier
6. Design of Oscillators.
7. Study of Basic Digital ICs and Implementation of Adder and Subtractor circuits
8. Design of Code converters.
9. Design and Implementation of Counters and registers using suitable ICs
10. Study of Multiplexer and Demultiplexer.
11. Design of Synchronous sequential circuit.

TOTAL: 45 hours

15GBE013 NUMERICAL METHODS 3 1 0 3

COURSE OBJECTIVE:

Understand the concepts of numerical techniques for solving system of equations. Represent experimental results numerically and to integrate (or differentiate) numerical data. Understand the numerical solution of ordinary differential equations and solve the equations under some simple conditions. Obtain the knowledge about the probability concepts and its distributions

COURSE OUTCOME:

CO-1: Be familiar with numerical solutions of nonlinear equations in a single variable, numerical interpolation and approximation of functions, numerical integration and differentiation, numerical solution of ordinary differential equations

CO-2: Be familiar with calculation and interpretation of errors in numerical methods,

CO-3: Solve a set of algebraic equations representing steady state models formed in engineering Problems

CO-4: Fit smooth curves for the discrete data connected to each other or to use interpolation methods over these data tables.

CO-5: Predict the system dynamic behavior through solution of ODEs modeling the system.

CO-6: Solve PDE models representing spatial and temporal variations in physical systems through numerical methods.

CO-7: Select appropriate numerical methods to apply to various types of problems in engineering and science inconsideration of the mathematical operations involved, accuracy requirements, and available computational resources.

CO-8: An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

CO-9: At the same time, the existence of commercial numerical libraries makes it inefficient and unnecessary for students to re-develop complex existing numerical routines.

CO-10: Solve non-linear equations, simultaneous linear algebraic equations, eigenvalue problems, using numerical methods.

UNIT I SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS 12

Solution of algebraic and transcendental equations –Fixed point iteration method – Newton Raphson method – Solution of linear system of equations- Gauss elimination method –pivoting- Gauss-Jordon method– Iterative methods of Gauss Jacobi and Gauss-Seidel - Matrix Inversion by Gauss Jordon method – Eigen value of a matrix by power method .

UNIT II INTERPOLATION AND APPROXIMATION 12

Interpolation with unequal intervals- Lagrange's interpolation – Newton's Divided difference interpolation – cubic splines – Interpolation with equal intervals- Newton's forward and backward difference formulae.

UNIT III NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials- Numerical integration using trapezoidal and Simpson's 1/3 rule – Romberg's method – Two point and Three point Gaussian quadrature formulae – Evaluation of double integrals by trapezoidal and Simpsons's 1/3 rules.

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS 12

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

UNIT V BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS 12

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain- One dimensional heat flow equation by explicit and implicit(crank Nicholson) methods – One dimensional wave equation by explicit method.

TOTAL:60 hours

TEXT BOOKS:

1. Grewal, B.S. and Grewal,J.S., " Numerical methods in Engineering and Science", 9th Edition, Khanna Publishers, New Delhi, 2012.

2. Gerald, C. F. and Wheatley, P.O., "Applied Numerical Analysis", 6th Edition, Pearson Education, Asia, New Delhi, 2006.

REFERENCE BOOKS:

1. Chapra, S. C and Canale, R. P., "Numerical Methods for Engineers", Tata McGraw-Hill, New Delhi, 5th Edition, 2007.

2. Sankara Rao K, "Numerical Methods for Scientisits and Engineers", Printice Hall of India,New Delhi, 3rd Edition,2007

3. Sivaramakrishna Das.P and Vijayakumari.C,Numerical Analysis, 2014, Pearson Eduaction Limited in south Asia,

15EEE041 ELECTRICAL MACHINES – II 3 0 0 3

COURSE OBJECTIVE:

To impart knowledge on Construction and performance of salient and non salient type synchronous generators. To impart knowledge on Principle of operation and performance of synchronous motor. To impart knowledge on Construction, principle of operation and performance of induction machines. To impart knowledge on Starting and speed control of three-phase induction motors. To impart knowledge on Construction, principle of operation and performance of single phase induction motors and special machines.

COURSE OUTCOME:

CO-1: Identify different types of synchronous and induction machines.

CO-2: Student understands the importance of design of machines based on their application.

CO-3: Basic methodology on calculation on synchronous and induction performance.

CO-4: Understand areas of application of synchronous and induction machines.

CO-5: Able to understand the operation of electrical machines.

CO-6: Able to select the appropriate types of electric machines based on their characteristics and the specific application requirements.

CO-7: Students will be able to analyze speed control of Synchronous Motors and Induction Motors.

CO-8: Students will be able to explain and obtain the active/reactive power capability of synchronous Generators.

CO-9: Gain knowledge on how to start synchronous and induction machines.

UNIT I SYNCHRONOUS GENERATOR 9

Constructional details – Types of rotors –winding factors- emf equation – Synchronous reactance –Armature reaction – Phasor diagrams of non salient pole synchronous generator connected to infinite bus-- Synchronizing and parallel operation – Synchronizing torque -Change of excitation and mechanical input- Voltage regulation – EMF, MMF, ZPF and A.S.A methods – steady state power angle characteristics– Two reaction theory –slip test -short circuit transients - Capability Curves

UNIT II SYNCHRONOUS MOTOR 9

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations – damper windings- synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 9

Constructional details – Types of rotors –- Principle of operation – Slip –cogging and crawling- Equivalent circuit – Torque-Slip characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of losses – Double cage induction motors – Induction generators – Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 9

Need for starting – Types of starters – DOL, Rotor resistance, Autotransformer and Star-delta starters– Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control – Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking.

UNIT V SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor- Shaded pole induction motor - Linear induction motor – Repulsion motor - Hysteresis motor - AC series motor- Servo motors- Stepper motors - introduction to magnetic levitation systems.

TOTAL: 45 hours

TEXT BOOKS:

1. A.E. Fitzgerald, Charles Kingsley, Stephen. D.Umans, ‘Electric Machinery’, Tata Mc Graw Hill publishing Company Ltd, 2003.

2. D.P. Kothari and I.J. Nagrath, ‘Electric Machines’, Tata McGraw Hill Publishing Company Ltd, 2002.

3. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

REFERENCE BOOKS:

1. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD.,New Delhi, 2009.
2. Charless A. Gross, "Electric /Machines, "CRC Press, 2010.
3. K. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, 2002.
4. Syed A. Nasar, Electric Machines and Power Systems: Volume I, Mcgraw -Hill College; International ed Edition, January 1995.
5. Alexander S. Langsdorf, Theory of Alternating-Current Machinery, Tata McGraw Hill Publications, 2001.

15EEE042 CONTROL SYSTEMS 3 1 0 3

COURSE OBJECTIVE:

To understand the use of transfer function models for analysis physical systems and introduce the control system components. To provide adequate knowledge in the time response of systems and steady state error analysis. To accord basic knowledge in obtaining the open loop and closed–loop frequency responses of systems.

To introduce stability analysis and design of compensators To introduce state variable representation of physical systems and study the effect of state feedback

COURSE OUTCOME:

CO-1: Obtain knowledge about the fundamentals of control systems.
CO-2: Analyze and Represent the mathematical model of a system.
CO-3: Resolve the time and frequency-domain response of first and second-order systems to various inputs.
CO-4: Understand the techniques of state variables.
CO-5: Know the computation of phase margin and gain margin using bode and Nyquist plot.
CO-6: Analyze the system stability.
CO-7: Compute and design the control system using Root locus Technique.
CO-8: Compute and obtain the stability of linear systems using Routh Hurwitz criterion.
CO-9: Understand the performance of lag- lead compensators for open loop systems.
CO-10: Design the Compensators using bode plot.

UNIT I SYSTEMS AND THEIR REPRESENTATION 12

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

UNIT II TIME RESPONSE 12

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

UNIT III FREQUENCY RESPONSE 12

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

UNIT IV STABILITY OF CONTROL SYSTEM 12

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterions.

UNIT V COMPENSATOR DESIGN 12

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots.

TOTAL: 60 hours

TEXT BOOKS:

1. Nagrath, I.J. and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, "Automatic Control systems", Pearson Education, New Delhi, 2003.

REFERENCE BOOKS:

1. Ogata, K. 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, "Control Systems Engineering", 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh," Control systems", Pearson Education, New Delhi, 2004
4. Gopal, M. 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

15EEE043 ELECTRICAL MACHINES - II LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To expose the students to the operation of synchronous machines and induction motors and give them experimental skill.

COURSE OUTCOME:

CO-1: Understand the concept of load test on three phase induction motor.
CO-2: Perform no load and blocked rotor test on three phase induction motor.
CO-3: To practically perform the electrical braking of three phase induction motor.
CO-4 To know about the load test of single phase induction motor.
CO-5: Perform regulation of alternator by synchronous impedance and mmf method.
CO-6: To impart knowledge on regulation of alternator by ZPF method
CO-7: To understand the concept of regulation of alternator by bus bar loading
CO-8: To familiarize about the concept of V-Curve and Inverted V-Curve of synchronous motor.
CO-9: Perform the Regulation of salient pole alternator by blonde's method.
CO-10: Understand the concept of load test three phase induction generator.

LIST OF EXPERIMENTS:

1. Load Test on 3 -Phase Induction Motor
2. No load Test and Blocked Rotor Test on 3- Phase Induction Motor
3. Electrical Braking of 3 -Phase Induction Motor
4. Load Test on 1- Phase Induction Motor
5. Regulation of Alternator by Synchronous Impedance and MMF Methods
6. Regulation of Alternator by ZPF Method
7. Regulation of Alternator by Bus bar Loading
8. V and Inverted V Curve of Synchronous Motor
9. Load test on 3 - Phase Induction Generator
10. Regulation of Salient Pole Alternator by Blonde's Method

TOTAL: 45 hours

REFERENCE BOOK:

1. Murugesh Kumar K, "Electrical Laboratory Exercises", Vikas Publishing House Pvt. Ltd., New Delhi 2003

15EEE044	**MEASUREMENTS AND CONTROL SYSTEMS LABORATORY**	**0**	**0**	**3**	**2**

COURSE OBJECTIVE:

To provide knowledge on analysis and design of control system along with basics of instrumentation

COURSE OUTCOME:

CO-1: Able to calibrate and test single phase energy meter,

CO-2: Able to measure resistance, inductance and capacitance using bridge circuits.

CO-3: Students will demonstrate the ability to apply what they have learned theoretically in the field of control engineering using both analog and digital techniques.

CO-4: Students will demonstrate the ability to apply Laplace transform, transfer functions for simulation and control.

CO-5: Know the electrical modeling of first order and second order system.

CO-6: Students will demonstrate the ability to conduct digital control experiments (using PC and Servo-trainer), analyze and interpret the results as they come up.

CO-7: Students will demonstrate the ability to design and determine control system's parameters and transfer functions by combining both theoretical and applied analysis that they have acquired in their control courses and in this lab.

CO-8: Students will demonstrate some practical experience in control engineering which might become a research point of interest in their field of study.

LIST OF EXPERIMENTS:

1. Calibration of 1-Phase Energy Meter
2. Measurement of linear displacement using LVDT
3. Measurement of strain using strain gauge
4. Study of characteristics of inductive and capacitive transducers
5. Measurement of physical variable with the help of LAB View
6. Transfer function of DC Motor. a) Armature Control Mode. b) Field Control Mode
7. Transfer function of AC Servomotor and Study of Synchros
8. Time & Frequency Response of the System Using MATLAB
9. Study of response of first and second order system using linear system simulator
10. Study of response of 2^{nd} order system with PID Controller using Simulink

TOTAL: 45 hours

15BESY41 BASIC LIFE SKILLS 1 0 1 2

COURSE OBJECTIVE:

Providing value education to improve the students' character - understanding of principled life and physical health - maintaining youthfulness - measures and methods in five aspects of life

COURSE OUTCOME:

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

CO-1: Acquire knowledge about the interconnections between the body, the breath, the mind, and the emotions in the context of maintaining resilience and well-being.

CO-2: Utilize skills developed through participation in Manavalakalai (SKY) Yoga to help maintain lifelong health and fitness.

CO-3: Demonstrate foundational standing, sitting , balance postures with proper alignment.

CO-4: Maintain youthfulness through kaya kalpa practice.

CO-5: Explore relaxation techniques to observe thoughts and to manage emotions and stress, and reflect on those techniques which are most effective to them.

CO-6: Ability to apply the principles of yoga in a personal way outside of yoga practice.

CO-7: Ability to apply effective breathing techniques to their yoga practice.

CO-8: Demonstrate an understanding of anatomy and physiology as it applies to the intentional integration of breath, postures, and movement within the practice of yoga.

CO-9: Identify asanas specific to their desired health benefits and create a yoga practice to use outside of class time.

CO-10: Achieve a greater sense of awareness, wisdom, introspection, and a deeper sense of relaxation through meditation.

UNIT I PHYSICAL HEALTH 6

1. Manavalakalai (SKY) Yoga: Introduction - Education as a means for youth empowerment - Greatness of Education - Yoga for youth Empowerment.
2. Simplified Physical Exercises: Hand, Leg, Breathing, Eye exercises - Kapalabathi, Makarasana Part I, Makarasana Part II, Body Massage, Acu pressure, Relaxation exercises - Benefits.
3. Yogasanas: Pranamasana - Hastha Uttanasana - Pada Hasthasana – AswaSanjalana Asana - Thuvipatha asva Sanjalana asana - Astanga Namaskara - Bhujangasana - Atha Muktha Savasana - Aswa Sanjalana Asana - Pada Hasthasana - Hastha Uttanasana - Pranamasana.
4. Pranayama : Naddi suddi - Clearance Practice - Benefits.

UNIT II LIFE FORCE 6

1. Reasons for Diseases - Natural reasons (Genetic / imprints, Planetary Position, Natural calamities and climatic changes) - Unnatural reasons (Food habits, Thoughts, Deeds)
2. Philosophy of Kaya kalpa - Physical body - Sexual vital fluid - Life force - Bio-Magnetism - Mind.
3. Maintaining youthfulness : Postponing old age - Transformation of food into seven components - Importance of sexual vital fluid –
4. Measure and method in five aspects of life - Controlling undue Passion.
5. Kayakalpa practice - Aswini Mudra - Ojas breath - Benefits of Kaya Kalpa.

UNIT III MENTAL HEALTH 6

1. Mental Frequencies - Beta, Apha, Theta and Delta wave - Agna Meditation explanation - benefits.
2. Shanthi Meditation explanation - Benefits
3. Thuriya Meditation explanation - Benefits
4. Benefits of Blessing - Self blessing (Auto suggestion) - Family blessing - Blessing the others - World blessing - Divine protection

UNIT IV VALUES 6

- Human Values:
  1. Self control - Self confidence - Honesty
  2. Contentment - Humility - Modesty
  3. Tolerance - Adjustment - Sacrifice - Forgiveness
  4. Purity (Body, Dress, Environment) - Physical purity - Mental purity - Spiritual purity
- Social Values:
  1. Non violence - Service
  2. Patriotism - Equality
  3. Respect for parents and elders - care and protection - Respect for teacher
  4. Punctuality - Time Management

UNIT V MORALITY (VIRTUES) 6

1. Importance of Introspection - I - Mine (Ego, Possessiveness).

2. Six Evil Temp eraments - Greed - Anger - Miserliness - Immoral sexual passion - Inferiority and superiority Complex – Vengeance.
3. Maneuvering of Six Temperaments - Contentment - Tolerance - Charity - Chastity - Equality - Pardon (Forgiveness).
4. Five essential Qualities acquired through Meditation: Perspicacity - Magnanimity - Receptivity - Adaptability – Creativity.
5. Improved Memory Power - Success in the Examination.

TOTAL: 30 h

REFERENCE BOOKS:

1. Vethathiri Maharishi, 16th Edi.2013, Yoga for Modern Age, Vethathiri Publications, Erode.
2. Vethathiri Maharishi, 2014, Simplified Physical Exercises, Vethathiri Publications, Erode.
3. Vethathiri Maharishi, 3rd Edi.2014, Kayakalpam, Vethathiri Publications, Erode.
4. Rev.Dr.G.U.pope, 2016, Thirukkural, Giri Trading Agency,
5. Vethathiri Maharishi, 1994, Mind, Vethathiri Publications, Erode.
6. Chandrasekaran.K, 1999, Sound Health through yoga, Sedapati, Tamilnadu, Premkalyan Publications.
7. Iyengar, B.K.S. 2008, Light on Yoga, Noida, UP India, Harber Collins Publishing India Ltd.,

15EEE051 POWER ELECTRONICS 3 1 0 3

COURSE OBJECTIVE:

To get an overview of different types of power semiconductor devices and their switching characteristics.To understand the operation, characteristics and performance parameters of controlled rectifiersTo study the operation, switching techniques and basics topologies of DC-DC switching regulators.To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.To study the operation of AC voltage controller and various configurations.

COURSE OUTCOME:

CO-1: Able to select the appropriate power semi conductor switches for different applications.
CO- 2: Able to design the protection and commutation circuits for SCRs.
CO- 3: Able to analyze, design Controlled Rectifiers for various loads and examine their performance.
CO -4: Examine the working, characteristics, performance of DUAL Converters and Battery Chargers.
CO -5: Able to analyze, design DC voltage regulator and examine their performance.
CO -6: Examine the working, characteristics, performance Switch Mode Power Supplies.
CO- 7: Able to design and analyze various topologies of Inverters and control the harmonic content of the inverters.
CO -8: Able to design and analyze the performance of AC Voltage Controllers.
CO -9: Able to design and analyze the performance of Cycloconverter.

UNIT I POWER SEMI-CONDUCTOR DEVICES 12

Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC, IGBT, MOSFET, - Turn-on and turn-off characteristics, switching losses, Commutation circuits for SCR

UNIT II PHASE-CONTROLLED CONVERTERS 12

2-pulse, 3-pulse and 6-pulse converters – Effect of source inductance – performance parameters – Reactive power control of converters – Dual converters - Battery charger.

UNIT III DC TO DC CONVERTER 12

Step-down and step-up chopper - Time ratio control and current limit control – Buck, boost, buck-boost converter, concept of Resonant switching - SMPS.

UNIT IV INVERTERS 12

Single phase and three phase (both 120^0 mode and 180^0 mode) inverters - PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM – Introduction to space vector modulations - Voltage and harmonic control - Series resonant inverter - Current source inverter - Induction Heating.

UNIT V AC TO AC CONVERTERS 12

Single – phase AC voltage controllers – Multistage sequence control - single and three phase cyclo converters – Integral cycle control for Temperature control – Power factor control – Matrix converters

TOTAL: 60 hours

TEXT BOOKS:

1. Rashid, M.H. 'Power Electronics: Circuits, Devices and Applications', Pearson Education, PHI Third edition, New Delhi, 2004.
2. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004

REFERENCE BOOKS:

1. Ashfaq Ahmed ,"Power Electronics for Technology", Pearson Education, Indian reprint, 2003.
2 Bimbra, P.S. "Power Electronics" Khanna Publishers, Third Edition 2003.
3. Ned Mohan, Tore.M.Undeland, William.P.Robbins, 'Power Electronics: Converters, Applications and Design', John Wiley and sons, Third edition, 2003.

15EEE052 TRANSMISSION AND DISTRIBUTION 3 0 0 3

COURSE OBJECTIVE:

To develop expressions for the computation of transmission line parameters.To obtain the equivalent circuits for the transmission lines based on distance and operating voltage for determining voltage regulation and efficiency. Also to improve the voltage profile of the transmission system.To analyses the voltage distribution in insulator strings and cables and methods to improve the same.To understand the operation of the different distribution schemes.

COURSE OUTCOME:

CO-1: To impart the knowledge of power system –general concepts ,lead and energy forecasting

CO-2: To make students capable of power system analysis, optimization of distribution system- network cost Modeling

CO-3: Interpret the various transmission concepts. Maintain voltage regulation and efficiency of transmission system.

CO-4: Able to Minimize the voltage drop of distribution systems.

CO-5: Able to Analyze economic loading of distribution transformers, system reliability

CO-6: Illustrate awareness of consumer services, tariffs, and costing, overhead and underground systems, line optimum design considerations.

CO-7: Create awareness of electrical safety and earthing practices, lightning protection

CO-8: To impart the knowledge of power capacitors-HT and LT capacitor installation

CO-9: An understanding of distribution automation system-SCADA systems and automation

UNIT I GENERATION AND TRANSMISSION SYSTEMS 9

Generation, Transmission & Distribution Scenario of India - Types of generation: Conventional and Non-conventional, Thermal Power Plant, Hydro Power Plant, Gas Power Plant, Nuclear Power Plant, Non-conventional Energy Sources - Load capacity factor - Connected load factor - Load duration curve - Selection of units.Various systems of transmission – Advantages of high transmission voltages - Comparison of conductor materials required for various overhead systems.

UNIT II OVERHEAD LINES PARAMETERS 9

Electrical constants - Resistance, Inductance and capacitance of Single and 3 Phase lines - Effects of earth on capacitance - Skin effect - Proximity effect - Transposition - Bundled conductors - Corona – Factors affecting corona - Line supports.

UNIT III OVERHEAD LINES PERFORMANCE 9

Short and medium transmission lines - Phasor diagrams - Nominal T and Pi methods - Line regulation - Efficiency. Rigorous solution for long line - ABCD constants - Ferranti effect - Tuned power lines - Surge impedance and surge impedance loading.

UNIT IV LINE INSULATORS AND UNDERGROUND CABLES 9

Types of overhead line insulators- Potential distribution over a string of suspension insulators - Methods of increasing string efficiency. Types of cables- Capacitance and insulation resistance - Sheath effects - Grading - Stresses - Loss angle – Power loss - Breakdown voltage - Optimum cable length -Comparison between overhead lines and underground cables.

UNIT V DISTRIBUTION SYSTEMS 9

Classification, functions and major components of substations - Feeders, distributors and service mains - Radial and ring main systems - Calculation of voltage in distributors with concentrated and distributed loads, AC 1-phase and 3-phase distribution systems.

TOTAL: 45hours

TEXT BOOKS:

1. Mehta V K, Rohit Mehta , "Principles of Power Systems", S.Chand & Co. Pvt. Ltd., New Delhi, 2004.
2. Singh S N," Electric Power Generation, Transmission and Distribution", Prentice-Hall of India Pvt., Ltd, Delhi, 2003.

REFERENCE BOOKS:

1. Soni M L, Gupta P V, Bhatnagar U S and Chakrabarthi A, "A Text Book on Power System Engineering", Dhanpat Rai & Co., New Delhi, 1997.
2. Uppal S L, "Electrical Power", Khanna Publishers, New Delhi, Thirteenth Edition, 1995.
3. Wadhwa C L, "Electrical Power Systems", New Age International Publishers, Delhi, 2006 Fourth Edition Reprint Aug, 2007.
4. Gupta J B, "A Course in Electrical Power", S. K. Kataria & Sons, 2003.
5. Gupta B R, "Generation of Electrical Energy", S.Chand & company New Delhi, Revised edition 2006
6. Kothari D P and Nagrath J," Power System Engineering", Tata McGraw-Hill Publishing Company New Delhi, second Edition, 2007.
7. Despande M V, 'Electrical Power Systems Design', Tata McGraw-Hill Publishing Company New Delhi, 2004.

15EEE053 ELECTRICAL MACHINE DESIGN 3 1 0 3

COURSE OBJECTIVE:

To design armature and field systems for D.C. machines. To design core, yoke, windings and cooling systems of transformers. To design stator and rotor of induction machines. To design stator and rotor of synchronous machines and study their thermal behavior.

COURSE OUTCOME:

CO-1: Understand the design of electrical machines with reference to magnetic, electric, mechanical and thermal design.
CO-2: Ability to analyze the magnetic circuit of electrical machine.
CO-3: Design of transformers with reduced loss
CO-4: Calculate the losses and efficiency in the machines
CO-5: Summarize the design considerations and constructional details of various Electrical Machines.
CO-6: Predict the performance of DC machine using design values.
CO-7: Design the overall dimensions and parts of Single Phase and Three Phase Transformers.
CO-8: Estimate the performance and design parameters of Induction Motors
CO-9: Calculate the design parameters of Synchronous Machine

UNIT I INTRODUCTION 12

Major considerations in Electrical Machine Design - Electrical Engineering Materials – Space factor – Choice of Specific Electrical and Magnetic loadings – Thermal considerations - Heat flow – Temperature rise - Rating of machines – Standard specifications.

UNIT II DC MACHINES 12

Output Equations – Main Dimensions - Magnetic circuit calculations – Carter's Coefficient - Net length of Iron –Real and Apparent flux densities – Selection of number of poles – Design of Armature – Design of commutator and brushes – performance prediction using design values.

UNIT III TRANSFORMERS 12

Output Equations – Main Dimensions - kVA output for single and three phase transformers – Window space factor – Overall dimensions – Operating characteristics – Regulation – No load current – Temperature rise in Transformers – Design of Tank - Methods of cooling of Transformers.

UNIT IV INDUCTION MACHINES 12

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 –– Magnetic leakage calculations – Leakage reactance of 3-phase machines- Magnetizing current - Short circuit current – Circle diagram - Operating characteristics.

UNIT V SYNCHRONOUS MACHINES 12

Output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – shape of pole face – Armature design – Armature parameters – Estimation of air gap length – Design of rotor –Design of damper winding – Determination of full load field mmf – Design of field winding – Design of turbo alternators – Rotor design.

TOTAL: 60 hours

TEXT BOOKS:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 1984.
2. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.

REFERENCE BOOKS:

1. Shanmugasundaram, A., G.Gangadharan, and R.Palani 'Electrical Machine Design Data Book', New Age Intenational Pvt. Ltd., Reprint, 2007.
2. Balbir Singh, 'Electrical Machine Design', Brite Publications, Pune

15EEE054 POWER ELECTRONICS LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To provide hands on experience with power electronic converter design and testing

COURSE OUTCOME:

CO-1: Able to elucidate the basic operation of various power semiconductor Devices.

CO-2: Able to analyze the AC to DC converter circuits for different loads.

CO-3: Able to analyze the DC to AC converter circuits for different loads.

CO-4: Able to analyze the AC to AC converter circuits for different loads.

CO- 5: Able to analyze and design of UPSs.

LIST OF EXPERIMENTS:

1. Characteristics of MOSFET, IGBT, SCR and TRIAC
2. 1-Phase and 3- Phase Diode Bridge Rectifier with R and RL Load
3. 1-Phase Half and Fully Controlled Thyristor converter with R and RL Load.
4. DC Chopper with R and RL Load
5. 1-Phase AC Voltage Controller with R and RL Load
6. Construction and testing of Ups using Inverter
7. 3- Phase PWM Inverter
8. 3- Phase AC Voltage Controller with R and RL Load
9. 3- Phase Fully Controlled Thyristor converter
10. Simulation of Power Electronic Circuits Using PSpice, PSIM and Simulink.

TOTAL: 45 hours

15EEE055	**MICROPROCESSORS AND MICROCONTROLLERS LABORATORY**	**0**	**0**	**3**	**2**

COURSE OBJECTIVE:

To provide training on programming of microprocessors and microcontrollers and understand the interface requirements

COURSE OUTCOME:

CO-1: Understand and apply the fundamentals of assembly level programming of 8085 microprocessors

CO-2: Understand 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.

CO-3: Work with standard microprocessor real time interfaces including GPIO, serial ports, digital-to-analog converters and analog-to-digital converters

CO-4: Able to interface Microprocessor and Microcontrollers with various peripheral devices and write assembling language programming for various interfacing.

CO-5: Analyze abstract problems and apply a combination of hardware and software to address the problem

CO-6: Use standard test and measurement equipment to evaluate digital interfaces

CO-7: An in-depth knowledge of applying the concepts of Microprocessor and Microcontrollers on industrial and real- time applications

CO-8: Apply knowledge of the microprocessor's internal registers and operations by use of a PC based microprocessor simulator.

LIST OF EXPERIMENTS:

1. Study of 8085 Microprocessor kit
2. Multi byte Binary Addition and Subtraction in 8085
3. Multi byte BCD Addition and subtraction in 8085
4. Table Processing using 8085
5. Multiplication and Division in 8085
6. Interfacing with 8085 a) Waveform Generation using 8255 b) Display unit
7. Addition and subtraction in 8051
8. Multiplication and Division in 8051
9. Programming 8051 on chip peripherals
10. Interfacing Stepper motor with 8085/8031

TOTAL: 45 hours

15EEE056 ELECTRIC CIRCUITS AND POWER ELECTRONICS SIMULATION LABORATORY 0 0 2 2

COURSE OBJECTIVE:

To make the student to design and analyze of electric circuits and power electronics circuits using a simulation software.

COURSE OUTCOME:

CO- 1: Able to understand the basic electric circuits concepts

CO- 2: Able to simulate and analyze the AC to DC converter circuits for different loads.

CO -3: Able to simulate and analyze the DC to AC converter circuits for different loads.

CO- 4: Able to simulate and analyze the AC to AC converter circuits for different loads.

CO -5: Able to analyze and design a UPS.

LIST OF EXPERIMENTS:

1. SIMULATION OF BASIC CIRCUITS

Verification of Ohm's Law- Verification of Kirchhoff's Laws-Analysis of Circuits using Kirchhoff's Laws, Mesh and Nodal analysis, voltage and current division.

2. SIMULATION OF NETWORK THEOREMS

Thevenin's Theorem, Norton's Theorem, Superposition Theorem, Maximum power transfer Theorem, Reciprocity Theorem.

3. SIMULATION OF PHASE-CONTROLLED CONVERTERS

Single phase half wave - Diode bridge rectifier with R load & RL Load - SCR based rectifier with R load & RL Load - SCR based rectifier with RL Load and free wheeling diode, Uncontrolled Single Phase – Centre Tapped full wave rectifier- bridge rectifier, Controlled Single Phase – Centre Tapped full wave rectifier- bridge rectifier, Three phase semi converter, Three Phase full converter

4. SIMULATION OF DC TO DC CONVERTER

Step-down and step-up chopper, Buck, boost, buck-boost converter

5. SIMULATION OF INVERTER AND AC VOLTAGE CONTROLLERS

Single phase and three phase (both 120^0 mode and 180^0 mode) inverters, Series resonant inverter, Current source inverter, Single – phase AC voltage controllers

TOTAL: 45 hours

15EEE061 ELECTRIC DRIVES AND CONTROL 3 0 0 3

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Understand basic necessities placed by mechanical systems on electric drives.

CO-2: Recognize the basic values of power electronics in drives using switch-mode converters and pulse width modulation to synthesize the voltages in dc and ac motor drives.

CO-3: Realize the basic concept of magnetic circuits as applied to electric machines.

CO-4: Know the two basic principles (generation of force and emf) that govern electromechanical energy conversion.

CO-5: Describe the operation of dc motor drives to satisfy four-quadrant operation to meet mechanical load requirements.

CO-6: Design torque, speed and position controller of motor drives.

CO-7: Clearly learn to use space vectors presented on a physical basis to describe the operation of an ac machine.

CO-8: Comprehend the basic principles of Permanent Magnet AC (Self-Synchronous AC) drives.

CO-9: Describe the operation of induction machines in steady state that allows them to be controlled in induction-motor drives.

CO-10: Learn speed control of induction motor drives in an energy efficient manner using power electronics.

CO-11: Learn the basic operation of stepper motors and switched-reluctance motor drives.

CO-12: Learn about the energy efficiency of electric drives and inverter-motor interactions.

UNIT I DRIVE CHARACTERISTICS 9

Equations governing motor load dynamics - steady state stability - Multi quadrant dynamics - Acceleration, deceleration, starting and stopping - load torque characteristics of various drives.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase fully controlled converter fed separately excited D.C motor drive - Continuous and discontinuous conduction Time ratio and current limit control - 4 quadrant operation of converter.

UNIT III DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor, load and converter – Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control, Design of controllers: Current controller and speed controller - Converter selection and characteristics - Use of simulation software package.

UNIT IV INDUCTION MOTOR DRIVES 9

Stator voltage control – energy efficient drive - V/f control, constant air-gap flux – field weakening mode - voltage/current fed inverters - Block diagram of vector control - closed loop control.

UNIT V SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor – Marginal angle control and power factor control - Permanent magnet synchronous motor Block diagram of closed loop control.

TOTAL: 45 hours

TEXT BOOKS:

1. Gopal K.Dubey, “Power Semi conductor controlled drives “ Prentice Hall Inc., New Jersey 1989.
2. Bimal K. Bose. ‘Modern Power Electronics and AC Drives’, PHI / Pearson Education, 2002.

REFERENCE BOOKS:

1. De, N.K. and S.K.Sen,”Electrical Drives” PHI, 9th print. 2006.
2. Murphy J.M.D. and Turnbull, “ Thyristor control of AC Motor” Pergamon Press Oxford 1988.
3. Krishnan, R. ‘Electric Motor and Drives Modeling, Analysis and Control’, Prentice Hall of India, 2001.

15EEE062 POWER SYSTEM ANALYSIS 3 1 0 3

COURSE OBJECTIVE

To model the power system under steady state operating condition. To apply efficient numerical methods to solve the power flow problem. To model and analyse the power systems under abnormal (or) fault conditions. To model and analyse the transient behaviour of power system when it is subjected to a fault.

COURSE OUTCOME:

CO-1: Understand the nature of the modern power system, including the behavior of the constituent components and sub-systems.

CO-2: Able to construct Y bus and Z bus foe analysis.

CO-3: Apply load flow analysis to an electrical power network and interpret the results for analysis.

CO-4: Analyze a network under both balanced and unbalanced fault conditions and interpret the results

CO-5: Demonstrate an understandi ng of the role of protection in modern power systems and to describe the operation of a range of protection schemes

CO-6: Demonstrate an awareness of the methods used for voltage regulation in electrical power networks.

CO-7: Analyze the transient stability of a single machine/infinite bus system using both analytical and time simulation methods

CO-8: Demonstrate an understanding of the factors which determine transient stability in both single machine and multi-machine systems.

CO-9: Describe the role of insulation co-ordination in the design and operation of power networks, including the role of circuit breakers

CO-10: Demonstrate the ability to conduct experiments in the electrical engineering laboratory in accordance with health and safety regulations and to record, interpret and report on the experimental results

UNIT I INTRODUCTION 12

Need for system planning and operational studies – basic components of a power system.-Introduction to restructuring - Single line diagram – per phase and per unit analysis – Generator - transformer –transmission line and load representation for different power system studies.- Primitive network -construction of Y-bus using inspection and singular transformation methods – z-bus.

UNIT II POWER FLOW ANALYSIS 12

Importance of power flow analysis in planning and operation of power systems - statement of powerflow problem - classification of buses - development of power flow model in complex variables form -iterative solution using Gauss-Seidel method - Q-limit check for voltage controlled buses – power flowmodel in polar form - iterative solution using Newton-Raphson method .

UNIT III FAULT ANALYSIS – BALANCED FAULTS 12

Importance of short circuit analysis - assumptions in fault analysis - analysis using Thevenin's theorem- Z-bus building algorithm - fault analysis using Z-bus – computations of short circuit capacity, postfault voltage and currents.

UNIT IV FAULT ANALYSIS – UNBALANCED FAULTS 12

Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines - sequence networks analysis of single line to ground,line to line and double line to ground faults using Thevenin's theorem and Z-bus matrix.

UNIT V STABILITY ANALYSIS 12

Importance of stability analysis in power system planning and operation - classification of power system stability - angle and voltage stability – Single Machine Infinite Bus (SMIB) system: Development of swing equation - equal area criterion - determination of critical clearing angle and time– solution of swing equation by modified Euler method and Runge-Kutta fourth order method.

TOTAL : 60 hours

TEXT BOOKS:

1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition,2011.
2. John J. Grainger and W.D. Stevenson Jr., 'Power System Analysis', Tata McGraw-Hill, Sixth reprint, 2010.
3. P. Venkatesh, B.V. Manikandan, S. Charles Raja, A. Srinivasan, ' Electrical Power Systems-Analysis, Security and Deregulation', PHI Learning Private Limited, New Delhi, 2012.

REFERENCE BOOKS:

1. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21st reprint, 2010.
2. Kundur P., 'Power System Stability and Control, Tata McGraw Hill Education Pvt. Ltd., New Delhi,10th reprint, 2010.
3. Pai M A, 'Computer Techniques in Power System Analysis', Tata Mc Graw-Hill Publishing Company Ltd., New Delhi, Second Edition, 2007.
4. J. Duncan Glover, Mulukutla S. Sarma, Thomas J. Overbye, ' Power System Analysis & Design',Cengage Learning, Fifth Edition, 2012.
5. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill PublishingCompany Limited, New Delhi, Second Edition, 2012.
6. C.A.Gross, "Power System Analysis," Wiley India, 2011.

15EEE063 SPECIAL ELECTRICAL MACHINES 3 0 0 3

COURSE OBJECTIVE

To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors. To impart knowledge on the Construction, principle of operation, control and performance of stepping motors. To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors. To impart knowledge on the Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors. To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors.

COURSE OUTCOME:

CO-1: Identify different types of synchronous and induction machines
CO-2: Explain how synchronous and induction machines works
CO-3: Basic calculation on synchronous and induction performance
CO-4: Understand areas of application of synchronous and induction machines
CO-5: To understand Construction, principle of operation and performance of synchronous reluctance motors.
CO-6: Gain knowledge on the Construction, principle of operation, control and performance of stepping motors.
CO-7: To know about the Construction, principle of operation, control and performance of switched reluctance motors.
CO-8: To understand Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors and permanent magnet synchronous motors

UNIT I SYNCHRONOUS RELUCTANCE MOTORS 9

Constructional features – Types – Axial and Radial flux motors – Operating principles – Variable Reluctance Motors – Voltage and Torque Equations - Phasor diagram - performance characteristics – Applications.

UNIT II STEPPER MOTORS 9

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Torque equations – Modes of excitation – Characteristics – Drive circuits – Microprocessor control of stepper motors – Closed loop control-Concept of lead angle– Applications.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features – Rotary and Linear SRM - Principle of operation – Torque production – Steady state performance prediction- Analytical method -Power Converters and their controllers –Methods of Rotor position sensing – Sensor less operation – Characteristics and Closed loop control – Applications.

UNIT IV PERMANENT MAGNET BRUSHLESS D.C. MOTORS 9

Permanent Magnet materials – Minor hysteresis loop and recoil line-Magnetic Characteristics – Permeance coefficient -Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power Converter Circuits and their controllers – Motor characteristics and control– Applications.

UNIT V PERMANENT MAGNET SYNCHRONOUS MOTORS 9

Principle of operation – Ideal PMSM – EMF and Torque equations – Armature MMF – Synchronous Reactance – Sine wave motor with practical windings - Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements– Applications.

TOTAL : 45 hours

TEXT BOOKS:

1. K.Venkataratnam, 'Special Electrical Machines', Universities Press (India) Private Limited, 2008.
2. T.J.E. Miller, 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press, Oxford, 1989.
3. T. Kenjo, 'Stepping Motors and Their Microprocessor Controls', Clarendon Press London, 1984.

REFERENCE BOOKS:

1. R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application', CRC Press, New York, 2001.
2. P.P. Aearnley, 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus London, 1982.
3. T. Kenjo and S. Nagamori, 'Permanent Magnet and Brushless DC Motors', Clarendon Press, London, 1988.
4. E.G. Janardanan, 'Special electrical machines', PHI learning Private Limited, Delhi, 2014.

15EEE064 DRIVES AND CONTROL LABORATORY 0 0 3 2

COURSE OBJECTIVE

To provide hands on experience with the working and operational control of both DC and AC motors.

COURSE OUTCOME:

CO-1: Apply the data in simulation of closed loop control of converter fed DC Motor.
CO-2: Apply the knowledge in simulation of closed loop control of chopper fed DC Motor.
CO-3: Realize the information in simulation of VSI fed 3Ø induction Motor
CO-4: Employ the knowledge in Speed control of 3Ø induction motor using PWM inverter.
CO-5: Implement the facts in speed control of Induction motor using SPWM.
CO-6: Execute the acquaintance in DSP Based closed loop drive for induction motor.
CO-7: Employ the awareness in DSP based chopper fed DC motor drive
CO-8: Implement the knowledge in PLC based drives

LIST OF EXPERIMENTS:

1. Simulation of closed loop control of converter fed DC Motor
2. Simulation of closed loop control of chopper fed DC Motor
3. Simulation of VSI fed 3Ø induction Motor
4. Simulation of 3Ø synchronous motor drive
5. Speed control of dc motor using 3Ø rectifier

6. Closed loop speed control of PMDC Motor Using 3Ø fully controlled converter

7. Speed control of 3Ø induction motor using PWM inverter

8. DSP Based closed loop drive for induction motor.

9. DSP based chopper fed DC motor drive

10. PLC based drives

11. Speed control of Induction motor using SPWM

12. Simulation of Speed control of Induction motor using space vector modulation

Total :45 hours

15EEE065 DIGITAL SIGNAL PROCESSING LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To emphasize the teaching of key DSP concepts, overview of discrete time signal .

COURSE OUTCOME:

CO-1: Characterize sampled systems in time and frequency domain.
CO-2: Generate various types of signals and plot their graph.
CO-3: Analyze the quick method to compute the convolution of two long sequences.
CO-4: Understand the concepts of Spectral analysis of DT signals
CO-5: Develop various DSP Algorithms using MATLAB Software package.
CO-6: Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital IIR-Butterworth, Chebyshev filters.
CO-7: Analyze and Observe Magnitude and phase characteristics (Frequency response Characteristics) of digital FIR filters using window techniques
CO-8: Develop and Implement DSP algorithms in software using a computer language such as C with TMS320C6713 floating point Processor

LIST OF EXPERIMENTS:

1. Generation of DT signals and determination of impulse response of LTI systems

2. Implementation of overlap save and overlap add methods of convolution

3. Determination of frequency response of LTI systems

4. Spectral analysis of DT signals
5. Implementation of FFT algorithm.
6. Design of IIR filters by BLT method
7. Design of IIR filters by Impulse Invariant method
8. Design of FIR filters using windows
9. Design of FIR Filters by optimal method
10. Implementation of convolution sum using Digital Signal Processor.

TOTAL: 45 hours

15EEE071 POWER SYSTEM OPERATION AND CONTROL 3 0 0 3

COURSE OBJECTIVE:

To have an overview of power system operation and control. To model power-frequency dynamics and to design power-frequency controller. To model reactive power-voltage interaction and the control actions to be implemented for maintaining the voltage profile against varying system load.To study the economic operation of power system. To teach about SCADA and its application for real time operation and control of power systems

COURSE OUTCOME:

CO– 1: Analyze and assess the Importance of load forecasting and simple techniques of Forecasting
CO– 2: Understand the outline of power system operation and control and the role of computers in the Implementation
CO– 3: Understand the essential basics of speed governing mechanism and modeling of power System
CO– 4: Develop Two-area system and analyze static performance of the system
CO– 5: Understand economic dispatch problem, calculation cost of generation, incremental cost Curve solution by direct method and λ- iteration method
CO – 6: Formulate and analyze complex solution for forward dynamic programming approach.And Numerical problems only in priority-list method using full-load average production cost
CO – 7: Solve economic dispatch problems and unit commitments problems in power systems.
CO – 8: Learn concept of energy control centere and their importance
CO – 9: Understand the control. System hardware configuration and SCADA and EMS Functions
CO– 10 learn concept of security analysis and control various operating states

UNIT I INTRODUCTION 9

System load – variation - load characteristics - load curves and load-duration curve (daily, weekly and annual) - load factor - diversity factor. Importance of load forecasting and simple techniques of forecasting. An overview of power system operation and control and the role of computers in the implementation. (Qualitative treatment with block diagram).

UNIT II ACTIVE POWER - FREQUENCY CONTROL 9

Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between two synchronous machines in parallel. Control area concept LFC control of a single-area system. Static and dynamic analysis of uncontrolled and controlled cases. Integration of economic dispatch control with LFC. Two-area system – modeling - static analysis of uncontrolled case - tie line with frequency bias control of two-area system - state variable model.

UNIT III REACTIVE POWER–VOLTAGE CONTROL 9

Basics of reactive power control. Excitation systems – 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 – tapchanging transformer. System level control using generator voltage magnitude setting, tap setting of OLTC transformer and Mvar injection of switched capacitors to maintain acceptable voltage profile and to minimize transmission loss.

UNIT IV COMMITMENT AND ECONOMIC DISPATCH 9

Statement of economic dispatch problem – cost of generation – incremental cost curve - co-ordination equations without loss and with loss, solution by direct method and λ- iteration method. (No derivation of loss coefficients). Statement of Unit Commitment problem – constraints; spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints. Solution methods - Priority-list methods - forward dynamic programming approach. Numerical problems only in priority-list method using full-load average production cost.

UNIT V COMPUTER CONTROL OF POWER SYSTEMS 9

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions. Network topology – 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: 45 hours

TEXT BOOKS:

1. Allen. J. Wood and Bruce F. Wollenberg, ‘Power Generation, Operation and Control’, John Wiley & Sons, Inc., 2003.
2. Chakrabarti & Halder, “Power System Analysis: Operation and Control”, Prentice Hall of India, 2004.

REFERENCE BOOKS:

1. Kothari, D.P. and I.J. Nagrath, 'Modern Power System Analysis', Tata McGraw Hill Publishing Company Limited, New Delhi, Third Edition, 2003.
2. Grigsby, L.L. 'The Electric Power Engineering, Hand Book', CRC Press & IEEE Press, 2001.
3. Hadi Saadat, "Power System Analysis", 11th Reprint 2007.
4. Kundur, P. 'Power System Stability and Control' MC Craw Hill Publisher, USA, 1994.
5. Olle.I.Elgerd, 'Electric Energy Systems theory An introduction' Tata McGraw Hill Publishing Company Ltd. New Delhi, Second Edition 2003.
6. Wadhwa,C.L."Electric Power System", New Age International Publications, 4th Edition,2005.

15EEE072 HIGH VOLTAGE ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

To understand the various types of over voltages in power system and protection methods. Generation of over voltages in laboratories. Measurement of over voltages. Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.Testing of power apparatus and insulation coordination.

COURSE OUTCOME:

CO-1: Understand the voltage surge, over voltages under voltage and its effects on power system network.
CO-2: Illustrate the importance Reflection and Refraction of Travelling waves- Protection against over Voltages.
CO-3: Understand the importance Breakdown Mechanisms in solid and composite dielectrics.
CO-4: Study the theory of DC, AC, impulse voltages and currents in the power system.
CO-5: Apply and learn the digital techniques in high voltage measurement.
CO-6: Apply the concept of high voltage testing of electrical power apparatus as per International and Indian Standards.
CO-7: Study the transient response of systems with series and shunt lumped parameters in the power system Network.
CO-8: Understands the DC testing methodology of Insulators, circuit breakers, bushing, isolators and Transformers. Analyze the standing waves and natural frequencies properties.
CO-9: Analysis and study the Power frequency, impulse voltage on circuit breaker and insulators.

UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary Over voltages, Corona and its effects – Reflection and Refraction of Travelling waves- Protection against over voltages.

UNIT II DIELECTRIC BREAKDOWN 9

Gaseous breakdown in uniform and non-uniform fields – Corona discharges – Vacuum breakdown –

Conduction and breakdown in pure and commercial liquids, Maintenance of oil Quality – Breakdown Mechanisms in solid and composite dielectrics.

UNIT III GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9

Generation of High DC, AC, impulse voltages and currents - Triggering and control of impulse generators.

UNIT IV MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9

High Resistance with series ammeter – Dividers, Resistance, Capacitance and Mixed dividers - Peak Voltmeter, Generating Voltmeters - Capacitance Voltage Transformers, Electrostatic Voltmeters – Sphere Gaps - High current shunts- Digital techniques in high voltage measurement.

UNIT V HIGH VOLTAGE TESTING & INSULATION COORDINATION 9

High voltage testing of electrical power apparatus as per International and Indian standards – Power frequency, impulse voltage and DC testing of Insulators, circuit breakers, bushing, isolators and transformers- Insulation Coordination.

TOTAL : 45 hours

TEXT BOOKS:

1. S.Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
2. E. Kuffel and W.S. Zaengl, J.Kuffel, 'High voltage Engineering fundamentals', Newnes Second Edition Elsevier , New Delhi, 2005.
3. Subir Ray,' An Introduction to High Voltage Engineering' PHI Learning Private Limited, New Delhi, Second Edition, 2013

REFERENCE BOOKS:

1. L.L. Alston, 'High Voltage Technology', Oxford University Press, First Indian Edition, 2011.
2. C.L. Wadhwa, 'High voltage Engineering', New Age International Publishers, Third Edition, 2010

15EEE073 POWER SYSTEMS PROTECTION AND SWITCH GEAR 3 0 0 3

COURSE OBJECTIVE

To educate the causes of abnormal operating conditions (faults, lightning and switching surges) of the apparatus and system. To introduce the characteristics and functions of relays and protection schemes.To impart knowledge on apparatus protection. To introduce static and numerical relays. To impart knowledge on functioning of circuit breakers.

COURSE OUTCOME:

CO-1: To Understand the Importance and Fundamental principles of protective systems.
CO-2: To Know the necessity of earthing and its importance in power system.
CO-3: Gain knowledge on the functions and characteristics of protective Relays and its various types.

CO-4: Knowledge about the Protection schemes of various apparatus like Bus bar, Generator, Transformer and Motor.

CO-5: Elucidate the Recovery and Restriking Voltage

CO-5: Acquire Knowledge about the application of Circuit Breakers.

CO-6: Ability to express the Testing of various types of Circuit Breakers

UNIT I INTRODUCTION 9

Importance of protective schemes for electrical apparatus and power system – Qualitative review of faults and fault currents - relay terminology – definitions – essential qualities of protection.

Protection against over voltages due to lightning and switching - arcing grounds - Peterson Coil - ground wires - surge absorber and diverters

Power System earthling – Neutral earthing - basic ideas of insulation coordination

UNIT II OPERATING PRINCIPLES AND RELAY CHARACTERISTICS 9

Electromagnetic relays – over current, directional and non-directional, distance, negative sequence, differential and under frequency relays – Introduction to static relays.

UNIT III APPARATUS PROTECTION 9

Main considerations in apparatus protection - transformer, generator and motor protection - protection of bus-bars - Transmission line protection - zones of protection – CTs, PTs and their applications in protection schemes.

UNIT IV THEORY OF CIRCUIT INTERRUPTION 9

Physics of arc phenomena and arc interruption. DC and AC circuit breaking – restriking voltage and recovery voltage - rate of rise of recovery voltage - resistance switching - current chopping - interruption of capacitive current.

UNIT V CIRCUIT BREAKERS 9

Types of circuit breakers – air blast, air break, oil, SF6 and vacuum circuit breakers – comparative merits of different circuit breakers – testing of circuit breakers.

TOTAL: 45 hours

TEXT BOOKS:

1. Soni, M.L. , P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, ‘A Text Book on Power System Engineering’, Dhanpat Rai & Co., 1998.
2. R.K.Rajput, “A Text book of Power System Engineering”, Laxmi Publications, First Edition Reprint 2007.

REFERENCE BOOKS:

1. Sunil S. Rao, ‘Switchgear and Protection’, Khanna publishers, New Delhi, 1986.
2. Wadhwa, C.L. ‘Electrical Power Systems’, New Age International (P) Ltd., 2000.
3. Ravindranath, B. and N. Chander, ‘Power System Protection & Switchgear’, Wiley Eastern Ltd., 1977.

4. Badri Ram, Vishwakarma, 'Power System Protection and Switchgear', Tata McGraw Hill, 2001.
5. Paithankar Y.G. and S.R. Bhide, 'Fundamentals of Power System Protection', Prentice Hall of India Pvt. Ltd., New Delhi, 2003

15EEE074 POWER SYSTEMS LABORATORY 0 0 3 2

COURSE OBJECTIVE:

To apply efficient numerical methods to solve the power flow problem. To model and analyse the power systems under abnormal (or) fault conditions. To model and analyse the transient behaviour of power system when it is subjected to a fault

COURSE OUTCOME:

CO-1 Computation of parameters and modeling of transmission lines.
CO-2 Acquire expertise in usage of modern tools.
CO-3 Define formation of bus impedance matrix and bus admittance matrix.
CO-4 Solution of power Flow using Gauss-Seidel method programmer construct Mat lab software.
CO-5 Solution of power Flow using Newton-Raphson method programmer construct Mat lab software.
CO-6 Give the solution based on programming for symmetrical and unsymmetrical fault analysis.
CO-7 Analysis of load frequency dynamics of single area and two area in power system.
CO-8 Design transient and small signal stability analysis in SMIB ,MULTI MACHINE power systems.
CO-9 Evaluate economic dispatch in power system.
CO-10 Explain Electromagnetic Transients in power system.

LIST OF EXPERIMENTS:

1. Computation of Parameters and Modeling of Transmission Lines

2. Formation of Bus Admittance and Solution of Networks

3. Formation of Bus impedance and solution of networks

4. Load Flow Analysis - I : Solution of Load Flow And Related Problems Using Gauss-Seidel Method

5. Load Flow Analysis - II: Solution of Load Flow and Related Problems Using Newton-Raphson Methods

6. Load Flow Analysis - II: Solution of Load Flow and Related Problems Using Fast-Decoupled Methods

7. Symmetrical Fault Analysis

8. Unsymmetrical fault Analysis

9. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System

10. Transient Stability Analysis of Multi-machine Power Systems

11. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems

12. Economic Dispatch in Power Systems

Total: 45 hours

15EEE075 DESIGN AND SIMULATION LABORATORY 0 0 3 2

COURSE OBJECTIVE:

Objective is to develop, test, and implement effective and efficient simulation techniques for modeling, evaluating, and optimizing systems

COURSE OUTCOME:

CO-1: Pertain numerical methods to circuit and system simulation
CO-2: Relate advanced considerations in circuit and system simulation
CO-3: Plan and implementation of simulation setup
CO-4: Interpret, extract, analyze and present simulation result
CO-5: Examine simulation results and effective documentation
CO-6: Display professional behavior
CO-7: Obtain expertise in usage of modern tools
CO-8: Understand the basics of Domestic online UPS
CO-9: Understand the basics of design and fabrication of variable 12V supply
CO-10: Understand the basics of design and fabrication of constant 5V supply

LIST OF EXPERIMENTS:

1. Design and Fabrication of 5V, 5AConstant Voltage Power supply
2. Design and Fabrication of 0-12 V, 1A Variable Power Supply
3. Design and Fabrication of Driver Circuit to drive an Electromagnetic relay using Microprocessor with required Protection.
4. Design and Fabrication of an isolation circuit using opto coupler which is required for Microcontroller interfacing
5. Design and Fabrication of Domestic UPS.

Total: 45 hours

SYLLABUS

DISCIPLINE SPECIFIC ELECTIVE COURSES

15EEE101 ELECTRONIC DEVICES AND CIRCUITS 3 0 0 3

COURSE OBJECTIVE:

Be familiar with the structure of basic electronic devices.Be exposed to the operation and application of electronic devices. To explain about the working and usage of Transistors , amplifiers & oscillators

COURSE OUTCOME:

CO-1: Understand the working and VI characteristics of different diodes like PN and Zener.

CO-2: Know the working of LED and LCD

CO-3: Understand the CE, CB, CC configurations and working of Bipolar Junction Transistors.

CO-4: Understand the operation of FET and its small signal model.

CO-5: Understand the characteristics and working of MOSFET

CO-6: Understand the concepts behind differential and feedback amplifiers

CO-7: Know the working of LC, RC and crystal oscillators.

CO-8: Understand the working of diode clampers and clippers

UNIT I PN DIODE AND ITS APPLICATIONS 9

PN junction diode - VI characteristics – temperature effects – Drift and diffusion currents – switching – Rectifiers: HWR, FWR, BR, filters - Zener diode – VI characteristics, Regulators (series and shunt), LED, LCD characteristics and applications.

UNIT II BJT AND ITS APPLICATIONS 9

Junction transistor – Transistor construction – Input and output characteristics – CE, CB and CC configurations – hybrid model – Analytical expressions – switching – RF application – Power transistors – Opto couplers.

UNIT III FET AND ITS APPLICATIONS 9

FET – VI characteristics, VP, JFET – small signal model – LF and HF equivalent circuits – CS and CD amplifiers –cascade and cascade – Darlington connection – MOSFET - Characteristics – enhancement and depletion.

UNIT IV AMPLIFIERS AND OSCILLATORS 9

Differential amplifiers: CM and DM – condition for ofc-feedback amplifiers – stability – Voltage / current, series / shunt feedback – oscillators – LC, RC, crystal

UNIT V PULSE CIRCUITS 9

RC wave shaping circuits – Diode clampers and clippers – Multivibrators – Schmitt triggers – UJT based saw tooth oscillators.

TOTAL: 45 hours

TEXT BOOKS:

1. Paynter, “Introductory Electronic Devices and Circuits, PHI, 2006.
2. David Bell “Electronic Devices and Circuits”, PHI, 2007

REFERENCE BOOKS:

1. Theodre F.Boghert, “Electronic Devices & Circuits” Pearson Education, VI Edition, 2003
2. Rashid, “Microelectronic circuits” Thomson Publication, 1999.
3. Singh, B.P. and Rekha Sing, “Electronic Devices and Integrated Circuits” Pearson Education, 2006.
4. Salivahanan.S,Suresh kumar.N “Electronic Devices & Circuits” Tata McGraw-Hill Education, 2011

15EEE102 ELECTROMAGNETIC THEORY 3 0 0 3

COURSE OBJECTIVE:

Understand the concept of electric fields. Understand the concept of magnetic fields Develop the theory of electrical machines. To know the application of Gauss law and ampere’s circuit law.

COURSE OUTCOME:

CO-1: Ability to know the basic concepts of electric field and magnetic field.

CO-2: Originate possible problems within the electrostatics, magnetostatics and stationary current Distributions

CO-3: Understand the use of Maxwell field equations and their symmetry and transformation properties, and limitations

CO-5: Ability to Solve Electrostatic and Magneto static circuits using Basic relations.

CO-6: Know the wave propagation in the dielectrics and the conductors in the transmission lines considering constraints.

CO-7: Understand the Applications of EM Waves in different domains

CO-8: Understand the functions and purpose of waveguides and the antennae.

UNIT I ELECTROSTATICS 9

Coulomb's law and electric fields, Gauss's law, potential and energy, conductors and dielectrics, Laplace and Poisson equations, solution methods, and capacitance.

UNIT II MAGNETOSTATICS 9

Biot-Savart and Ampere's laws, inductance calculation, Magnetic materials, Faraday's law and quasi-static analysis.

UNIT III ELECTRODYNAMIC FIELDS 9

Maxwell equations and uniform plane waves, Wave propagation in dielectrics and conductors, skin effect, normal incidence, Oblique incidence, Snell's law, and total internal reflection.

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UNIT IV ELECTROMAGNETIC WAVES 9

Transmission lines, Smith chart, impedance matching, Transients and pulse propagation on transmission line.

UNIT V WAVE GUIDES AND ANTENNAS 9

Waveguides: Metallic and Dielectric, Antenna fundamentals.

TOTAL: 45 hours

TEXT BOOKS:

1. Mathew N. O. SADIKU, “Elements of Electromagnetics”, Oxford University press Inc. First India Edition,2007.
2. Ashutosh Pramanik, “Electromagnetism – Theory and Applications”, Prentice-Hall of India Private Limited, New Delhi, 2006.

REFERENCE BOOKS:

1. Joseph A. Edminister, “Theory and Problems of Electromagnetics”, Second Edition, Schaum Series, Tata McGraw Hill, 1993.
2. William H. Hayt, “Engineering Electromagnetics”, Tata McGraw Hill Edition, 2001.
3. Kraus and Fleish, “Electromagnetics with Applications”, McGraw Hill International Editions, Fifth Edition, 1999.

15EEE103 LINEAR INTEGRATED CIRCUITS 3 0 0 3

COURSE OBJECTIVE:

To study the IC fabrication procedure. To study characteristics; realize circuits; design for signal analysis using Op-amp ICs. To study the applications of Op-amp. To study internal functional blocks and the applications of special ICs like Timers, PLLcircuits, regulator Circuits, ADCs.

COURSE OUTCOME:

CO-1: An in-depth knowledge in the fabrication of Integrated Circuits.

CO-2: Familiar with the op-amp's basic construction, characteristics, parameter limitations, various configurations and countless applications of op-amp.

CO-3: Infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.

CO-4: Elucidate and design the linear and non-linear applications of an opamp and special application ICs.

CO-5: Analyze and Observe the Frequency response of various filters.

CO-6: Design and analyze oscillators and multivibrator circuits using op-amp.

CO-7: Classify and comprehend the working principle of data converters.

CO-7: Illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.

CO-8: Understand the working of 555 timer and 565 Phase Locked Loop and its application.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

UNIT II APPLICATIONS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

UNIT III CHARACTERISTICS OF OPAMP 9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

UNIT IV SPECIAL ICs 9

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

UNIT V APPLICATION ICs **9**

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

TOTAL: 45 hours

TEXT BOOKS:

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI.(2000)
2. Roy Choudhary, D.and Sheil B.Jani, 'Linear Integrated Circuits', II Edition, New Age, 2003.

REFERENCE BOOKS:

1.Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', TataMcGraw Hill, 2003.

2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.

3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997

15EEE104 MEASUREMENTS AND INSTRUMENTATION 3 0 0 3

COURSE OBJECTIVE:

To introduce the basic functional elements of instrumentation. To introduce the fundamentals of electrical and electronic instruments. To educate on the comparison between various measurement techniques. To introduce various storage and display devices. To introduce various transducers and the data acquisition systems.

COURSE OUTCOME:

CO-1: Understand the basic useful features of instrumentation equipments.
CO-2: Train on the relationship between various measurement procedures.
CO-3: Practice the methods and skills for electrical projects
CO-4: Propose a system, component or process to meet desired requirement in electrical engineering.
CO-5: Balance Bridges to determine unknown values.
CO-6: capability to measure frequency, phase with Oscilloscope
CO-7: Train to measure strain, displacement, Velocity, Angular Velocity, temperature, Pressure, Vacuum, and flow.
CO-8: Familiarize with various transducers and the data acquisition systems.

UNIT I INTRODUCTION **9**

Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration.

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS **9**

Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energymeters – Magnetic measurements – Determination of B-H curve and measurements of iron loss –Measurements using Instrument transformers – Instruments for measurement of frequency and phase.

UNIT III COMPARISON METHODS OF MEASUREMENTS **9**

D.C & A.C potentiometers - D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Interference & screening – Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques.

UNIT IV STORAGE AND DISPLAY DEVICES **9**

Magnetic disk and tape – Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD & dot matrix display – Data Loggers

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS **9**

Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Piezoelectric, optical and digital transducers – Elements of data acquisition system - A/D, D/A converters – Smart sensors.

TOTAL: 45 hours

TEXT BOOKS:

1. Doebelin, E.O., “Measurement Systems – Application and Design”, Tata McGraw Hill Publishing Company, 2003.
2. Sawhney, A.K.,”A Course in Electrical & Electronic Measurements and Instrumentation”, Dhanpat Rai and Co, 2004.

REFERENCE BOOKS:

1. Bouwens, A.J.,”Digital Instrumentation”, Tata McGraw Hill, 1997.
2. Moorthy, D.V.S., “Transducers and Instrumentation”, Prentice Hall of India Pvt Ltd, 2007.
3. Kalsi, H.S.,”Electronic Instrumentation”, Tata McGraw Hill, II Edition 2004.
4. Martin Reissland, ‘Electrical Measurements’, New Age International (P) Ltd., Delhi, 2001.
5. Gupta, J. B.,”A Course in Electronic and Electrical Measurements”, S. K. Kataria & Sons, Delhi, 2003.

15EEE105 POWER PLANT ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Acquire brief knowledge about different types of Power Plants, site selection criteria of each one of them.

CO-2: Understand the Thermal Power Plant Operation, turbine governing, different types of high pressure boilers including supercritical and supercharged boilers, Fluidized bed combustion systems.

CO-3: Gain knowledge of cooling tower operation and condenser design.

CO-4: Get familiarized about the various types of Nuclear power plants including Pressurized water reactor, boiling water reactor, gas cooled reactor, liquid metal fast breeder reactor.

CO-5: Understand the Power Plant Economics and Energy Storage

CO-6: Learn about environmental and safety aspects of power plant operation.

CO-7: Capability to evaluate load factor, capacity factor, average load and peak load on a power plant

CO-8: Know about the safety aspects of power plants

UNIT I COAL BASED THERMAL POWER PLANTS **9**

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

UNIT II DIESEL, GAS TURBINE AND COMBINED CYCLE POWER PLANTS **9**

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

UNIT III NUCLEAR POWER PLANTS **9**

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

UNIT IV POWER FROM RENEWABLE ENERGY **9**

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

UNIT V ENERGY, ECONOMIC AND ENVIRONMENTAL ISSUES OF POWER PLANTS **9**

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

TOTAL : 45 hours

TEXT BOOK:

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

REFERENCE BOOKS

1. M.M. El-Wakil, Power Plant Technology, Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Black & Veatch, Springer, Power Plant Engineering, 1996.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, Standard Handbook of Power Plant Engineering, Second Edition, McGraw – Hill, 1998.
4. Godfrey Boyle, Renewable energy, Open University, Oxford University Press in association with the Open University, 2004.

15EEE106 DIGITAL SIGNAL PROCESSING 3 0 0 3

COURSE OBJECTIVE:

To bring out the concepts related to stationary and non-stationary random signals To emphasize the importance of true estimation of power spectral density To introduce the design of linear and adaptive systems for filtering and linear prediction.

COURSE OUTCOME:

CO-1: Represent discrete-time signals analytically and visualize them in the time domain.
CO-2: Identity the properties of discrete-time systems such as time-invariance, stability, causality, and linearity.
CO-3: Obtain knowledge about time-frequency analysis.
CO-4: Compute the Fourier series and the discrete time Fourier transform (DTFT) of discrete-time signals.
CO-5: Analyze digital signal processing systems using Z-transform and the DTFT.
CO-6: Compute the linear and circular convolutions of discrete-time sequences.
CO-7: Evaluate the Discrete Fourier Transform (DTFT) of a sequence and relate it to Discrete time Fourier Transform (DTFT) and use DFT to compute linear convolution of two sequences.
CO-8: Obtain knowledge about DFT and FFT and the advantages of FFT.
CO-9: Use the Fast Fourier Transform in a variety of applications including: signal analysis, fast convolution, spectral and temporal interpolation, and filtering
CO-10: Ability to design linear digital filters both FIR and IIR using different techniques and their associated tructures.
CO-11 Realize the characterization of random signals, filter design techniques, and imperfections caused by finite word length.
CO-12: Familiar with finite word-length effects and round off noise computations in DSP systems.

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS 9

Classification of Signals: Continuous time signals - Discrete time signals - Periodic and A periodic signals - Even and odd signals - Energy and power signals -Deterministic and random signals -Complex exponential and Sinusoidal signals. Unit step, Unit ramp, Unit impulse - Representation of signals in terms of unit impulse.

Classification of Systems: Continuous time systems- Discrete time systems - Linear system - Time Invariant system - causal system - BIBO system - Systems with and without memory - LTI system.

UNIT II LINEAR TIME INVARIANT – CONTINUOUS AND DISCRETE TIME SYSTEMS 9

Differential equation - impulse response - Frequency response - Convolution - Discrete time Fourier transform (DTFT) and its properties- Z-transform-Definition transforms - properties of z–transform– Inverse Z transform: Power series expansion - Partial fraction.

UNIT III DISCRETE FOURIER TRANSFORMS 9

Difference equations, Block diagram representation, LTI systems , DFT and its properties, Relation between DTFT and DFT, FFT computations using Decimation in time and Decimation in frequency algorithms, Overlap-add and save methods.

UNIT IV INFINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Review of design of analogue Butterworth and Chebyshev Filters, Frequency transformation in analogue domain – Design of IIR digital filters using impulse invariance technique – Design of digital filters using bilinear transform – pre warping – Realization is using direct, cascade and parallel forms.

UNIT V FINITE IMPULSE RESPONSE DIGITAL FILTERS 9

Symmetric and Anti symmetric FIR filters – Linear phase FIR filters – Design using Hamming, Hanning and Blackmann Windows – Frequency sampling method –Realization of FIR filters – Transversal, Linear phase and Polyphase structures- Fixed point and floating point number representations – Comparison – Truncation and Rounding errors - Quantization noise- Overflow error- Roundoff noise power - limit cycle oscillations due to product roundoff and overflow errors

TOTAL: 45 hours

TEXT BOOKS:

1. John G Proakis and Manolakis, “Digital Signal Processing Principles, Algorithms and Applications”, Pearson, Fourth Edition, 2007.
2. Salivahanan, S., A. Vallavaraj, C. Gnanapriya, Digital Signal Processing, TMH/McGraw Hill International, 2007

REFERENCE BOOKS:

1. Oppenheim, Alan V., Schafer, Ronald W. ”Discrete-Time Signal Processing” Prentice-Hall, 1989.
2. Ifeachor,E.C.and B.W. Jervis, “ Digital signal processing – A practical approach”, Second edition, Pearson, 2002.
3. Mitra,S.K.,”Digital Signal Processing, A Computer Based approach, Tata McGraw Hill, 1998.

4. Johny R. Johnson,"Introduction to Digital Signal Processing", PHI, 2006.

15EEE107 COMPUTER AIDED POWER SYSTEM ANALYSIS 3 0 0 3

COURSE OBJECTIVE:

This course will cover the modeling issues and analysis methods for the power flow, short circuit, contingency and stability analyses, required to be carried out for the power systems. Necessary details of numerical techniques to solve nonlinear algebraic as well as differential equations and handling of sparse matrices will also be included.

COURSE OUTCOME:

CO-1: Able to calculate the parameters required for modeling of transmission lines from the conductor configuration and physical characteristics of the lines.

CO-2: Calculate the power transfer capability of transmission lines.

CO-3: Understand the recent techniques and computer application for modeling of practical and large interconnected power system networks using programming languages.

CO-4: Able to analyze the real and reactive power flows and optimal scheduling.

CO-5: Model the networks in terms of symmetrical components and sequence networks.

CO-6: Understand the Effect of outage of any important component of power system on the operation and reliability of power systems.

CO-7: Learn the algorithm required finding out parameters for monitoring and control of power system in real time from actual measurement data.

CO-8: Able to use Computer Algorithms to solve algebra-differential pertaining to power system to assess the stability performance of power systems.

UNIT I NETWORK FORMULATION & MODELLING 9

Need for system analysis in planning and operation of power system- One line diagram- Per unit representation - Symmetrical components - short circuits analysis for fault on machine terminals. Primitive network and its representation – bus incidence matrix – Formation of Bus admittance matrix and bus impedance matrices.- modeling of synchronous machines , transformers, loads, Π-equivalent circuit of transformer with off-nominal tap ratio.

UNIT II SHORT CIRCUIT STUDIES 9

Types of faults - Algorithms for fault calculations — sequence impedance matrices - Symmetrical and unsymmetrical fault analysis using Z_{bus}.

UNIT III LOAD FLOW STUDIES 9

Formulation of load flow problem - bus classification – Solution by Gauss - Seidal , Newton - Raphson and Fast decoupled methods - Comparison -. Computation of slack bus power, transmission loss and line flow.

UNIT IV ECONOMICAL OPERATION OF GENERATING STATIONS 9

Optimal operation of generators – economical scheduling of thermal plant with and without transmission losses – Loss formula derivation- unit commitment - Elementary idea of optimal load scheduling of Hydro - Thermal plants.

UNIT V STABILITY STUDIES 9

Steady state and transient stability - Swing equation and its solution by modified Euler and Runge-Kutta methods - Equal area criterion - Factors affecting stability and methods of improving stability- Causes of voltage instability – voltage stability proximity indices for two-bus system.

TOTAL: 45 hours

TEXT BOOKS:

1. Hadi Saadat,"Power System Analysis", Tata McGraw-Hill Editions ,2007
2. Gupta B R, "Power System Analysis and Design", S.Chand and company Ltd., New Delhi, 2005.

REFERENCE BOOKS:

1. PAI, M A,"Computer Techniques in Power System Analysis" Tata McGraw-Hill, Second edition, 2006
2. Wadhwa C L "Electrical Power Systems", New Age International (P) Ltd, New Delhi, Third Edition, 2003.
3. Kothari D P, Nagrath I J, "Power System Engineering "Tata McGraw-Hill, Second edition.
4. Nagsarkar T K, Sukhija M S, "Power system Analysis", Oxford University Press, 2007.

15EEE108 ELECTRIC ENERGY UTILIZATION AND CONSERVATION 3 0 0 3

COURSE OBJECTIVE:

To impart knowledge on Generation of electrical power by conventional and non–conventional methods, Electrical energy conservation, energy auditing and power quality, Principle and design of illumination systems and methods of heating and welding, Electric traction systems and their performance, Industrial applications of electric drives.

COURSE OUTCOME:

CO-1: To impart the knowledge of Electric Traction, Electric heating, Electric welding and Illumination

CO-2: To make students capable of analyzing and solving the varieties of problems and issues in electric power utilization

CO-3: Enable the students to design of interior and exterior lighting systems- illumination levels for various purposes light fittings- factory lighting- flood lighting-street lighting

CO-4: Create awareness of energy conservation

CO-5: To impart the knowledge on different methods of conventional and non-conventional power generation

CO-6: To understand the concept of braking in electric traction.

CO-7: To know about the economic aspects of power generation.

CO-8: To acquire knowledge on Energy auditing.

UNIT I POWER GENERATION 9

Review of conventional methods – thermal, hydro and nuclear based power generation - Non-conventional methods of power generation – fuel cells - tidal waves – wind – geothermal – solar - bio-mass - municipal waste. Cogeneration. Effect of distributed generation on power system operation.

UNIT II ECONOMIC ASPECTS OF GENERATION 9

Economic aspects of power generation – load and load duration curves – number and size of units – cost of electrical energy – tariff. Economics of power factor improvement – power capacitors – power quality.
Importance of electrical energy conservation – methods – energy efficient equipments - Introduction to energy auditing.

UNIT III ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination - schemes for residential, commercial, street lighting, and sports ground – energy efficient lamps.

UNIT IV INDUSTRIAL HEATING AND WELDING 9

Role electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces.Resistance welding - Arc welding - Laser welding – Ultra sonic Welding – welding generator - welding transformer.

UNIT V ELECTRIC TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

TOTAL: 45 hours

TEXT BOOKS:

1. Wadhwa, C.L. ‘Generation, Distribution and Utilization of Electrical Energy’, New Age International Pvt. Ltd, 2003.
2. Gupta, B.R. ‘Generation of Electrical Energy’, Eurasia Publishing House (P) Ltd, New Delhi, 2003.

REFERENCE BOOKS:

1. Partab, H. ‘Art and Science of Utilisation of Electrical Energy’, Dhanpat Rai and Co, New Delhi, 2004.
2. Openshaw Taylor, E. ‘Utilization of Electrical Energy in SI Units’, Orient Longman Pvt. Ltd, 2003.
3. Gupta, J.B.‘Utilization of Electric Power and Electric Traction’, S.K.Kataria and Sons, 2002

15EEE109 HIGH VOLTAGE DIRECT CURRENT TRANSMISSION 3 0 0 3

COURSE OBJECTIVE:

To understand the concept, planning of DC power transmission and comparison with AC Power transmission. To analyze HVDC converters.To study about the HVDC system control.To analyze harmonics and design of filters. To model and analysis the DC system under study state.

COURSE OUTCOME:

CO-1: Understand the merits and demerits DC transmission system
CO-2: Clarify the application of converter configuration and converter characteristics
CO-3: Apply the operating topologies of a 12 pulse converters and firing schemes.
CO-4: Learn Converter control characteristics, Firing angle control and extinction angle control Schemes
CO-5 Able to calculate the reactive power requirement and harmonics control methods
CO-6: Learn the design procedure for filters in high voltage application
CO-7: Apply the concept of SVC and STATCOM for high voltage direct current transmission
CO-8: Understand the power flow in AC/DC systems
CO-9: Understands the Per unit system for DC quantities

UNIT I INTRODUCTION 9

DC Power transmission technology – Comparison of AC and DC transmission – Application of DC transmission – Description of DC transmission system – Planning for HVDC transmission – Modern trends in HVDC technology – DC breakers – Operating problems – HVDC transmission based on VSC – Types and applications of MTDC systems.

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter - Analysis of Graetz circuit with and without overlap - Pulse number – Choice of converter configuration – Converter bridge characteristics – Analysis of a 12 pulse converters – Analysis of VSC topologies and firing schemes.

UNIT III CONVERTER AND HVDC SYSTEM CONTROL 9

Principles of DC link control – Converter control characteristics – System control hierarchy – Firing angle control – Current and extinction angle control – Starting and stopping of DC link – Power control – Higher level controllers – Control of VSC based HVDC link.

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state – Sources of reactive power – SVC and STATCOM – Generation of harmonics – Design of AC and DC filters – Active filters.

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Per unit system for DC quantities – DC system model – Inclusion of constraints – Power flow analysis – case study.

TOTAL: 45 hours

TEXT BOOKS:

1. Padiyar, K. R., “HVDC power transmission system”, New Age International (P) Ltd., New Delhi, Second Edition, 2010.

2. Edward Wilson Kimbark, “Direct Current Transmission”, Vol. I, Wiley interscience, New York, London, Sydney, 1971.

3. Rakosh Das Begamudre, “Extra High Voltage AC Transmission Engineering”, New Age International (P) Ltd., New Delhi, 1990.

REFERENCE BOOKS:

1. Kundur P., “Power System Stability and Control”, McGraw-Hill, 1993.

2. Colin Adamson and Hingorani N G, “High Voltage Direct Current Power Transmission”, Garraway Limited, London, 1960.

3. Arrillaga, J., “High Voltage Direct Current Transmission”, Peter Pregrinus, London, 1983.

4. S. Kamakshaiah, V. Kamaraju, ‘HVDC Transmission’, Tata McGraw Hill Education Private Limited, 2011.

15EEE110 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS 3 0 0 3

COURSE OBJECTIVE:

To Provide knowledge about the stand alone and grid connected renewable energy systems. To equip with required skills to derive the criteria for the design of power converters for renewable energy applications. To analyse and comprehend the various operating modes of wind electrical generators and solar energy systems. To design different power converters namely AC to DC, DC to DC and AC to AC converters for renewable energy systems. To develop maximum power point tracking algorithms.

COURSE OUTCOME:

CO-1: Understand the use of power converters in wind turbines

CO-2: Understand the use of power converters in PV applications

CO-3: Understand the concept of maximum power point tracking

CO-4: Understand how real and reactive power flow can be controlled from a renewable or distributed energy resource to the utility network

CO-5: Develop analytical techniques for analyzing the steady-state and dynamic characteristics of converters

CO-6: Understand the quadrant operation of various types of converters and their control requirements, selection of converters, components, etc.

CO-7: Understand how to design the hierarchical control structures for power converters and systems.

CO-8: Be able to select and design important elements of a power converter system.

CO-9: Understand the working of different renewable energy systems

UNIT I INTRODUCTION **9**

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

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION **9**

Reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG.

UNIT III POWER CONVERTERS **9**

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS **9**

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

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS **9**

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

TOTAL : 45 hours

TEXT BOOKS:

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

REFERENCE BOOKS:

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

15EEE111 OPTIMISATION TECHNIQUES 3 0 0 3

COURSE OBJECTIVE:

To introduce the basic concepts of linear programming To educate on the advancements in Linear programming techniques To introduce non-linear programming techniques To introduce the interior point methods of solving problems To introduce the dynamic programming method

COURSE OUTCOME:

CO-1: Formulate optimization models and problems.
CO- 2: Understand and apply the concept of optimality criteria for various types of optimization problems.
CO- 3: Solve various constrained and unconstrained problems in single variable as well as multivariable.
CO-4: Apply the methods of optimization in real life situation.
CO-5: Understand the methods of sensitivity analysis and post processing of results
CO-6: Able to apply to a wide range of engineering problems

UNIT I LINEAR PROGRAMMING 9

Introduction - formulation of linear programming model-Graphical solution–solving LPP using simplex algorithm – Revised Simplex Method.

UNIT II ADVANCES IN LPP 9

Dualit theory- Dual simplex method - Sensitivity analysis–-Transportation problems– Assignment problems-Traveling sales man problem -Data Envelopment Analysis.

UNIT III NON LINEAR PROGRAMMING 9

Classification of Non Linear programming – Lagrange multiplier method – Karush – Kuhn Tucker conditions– Reduced gradient algorithms–Quadratic programming method – Penalty and Barrier method.

UNIT IV INTERIOR POINT METHODS 9

Karmarkar's algorithm–Projection Scaling method–Dual affine algorithm–Primal affine algorithm Barrier algorithm

UNIT V DYNAMIC PROGRAMMING 9

Formulation of Multi stage decision problem–Characteristics–Concept of sub-optimization and the principle of optimality–Formulation of Dynamic programming–Backward and Forward recursion– Computational procedure–Conversion offinal value problem in to Initial value problem.

TOTAL: 45hours

TEXT BOOKS:

1. Hillier and Lieberman "Introduction to Operations Research", TMH, 2000.
2. R.Panneerselvam, "Operations Research", PHI, 2006
3. Hamdy ATaha, "Operations Research –An Introduction", Prentice Hall India, 2003.

REFERENCE BOOKS:

1. Philips, Ravindran and Solberg, “Operations Research”, John Wiley, 2002.

2. Ronald L.Rardin, “Optimization in Operation Research” Pearson Education Pvt. Ltd. New Delhi, 2005.

15EEE112 ADVANCED CONTROL SYSTEMS 3 0 0 3

COURSE OBJECTIVE:

To provide knowledge on design in state variable form To provide knowledge in phase plane analysis To give basic knowledge in describing function analysis. To study the design of optimal controller. To study the design of optimal estimator including Kalman Filter

COURSE OUTCOME:

CO-1: To understand the methodologies in pole placement and design.

CO-2: Learning the methods of servo design using proportional and integral controllers

CO-3: To get a brief insight about the features of linear and non-linear systems

CO-4: To learn about the phase plane analysis of linear and non-linear systems

CO-5: Understanding the characteristics of functional analysis of non-linear systems

CO-6: To elucidate the stability of oscillations of any system

CO-7: To learn about the optimal control of time varying system.

CO-8: To understand the optimal estimation using kalman filter using real time examples

UNIT I STATE VARIABLE DESIGN 9

Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: -State Feedback with integral control.

UNIT II PHASE PLANE ANALYSIS 9

Features of linear and non-linear systems - Common physical non-linearities – Methods of linearization Concept of phase portraits – Singular points – Limit cycles – Construction of phase portraits – Phase plane analysis of linear and non-linear systems – Isocline method.

UNIT III DESCRIBING FUNCTION ANALYSIS 9

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – limit cycles – Stability of oscillations.

UNIT IV OPTIMAL CONTROL 9

Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti’s equation – Application examples.

UNIT V OPTIMAL ESTIMATION **9**

Optimal estimation – Kalman Bucy Filter-Solution by duality principle-Discrete systems- Kalman Filter-Application examples..

TOTAL : 45 hours

TEXT BOOKS :

1. K. P. Mohandas, “Modern Control Engineering”, Sanguine Technical Publishers, 2006.
2. G. J. Thaler, “ Automatic Control Systems”, Jaico Publishing House, 1993.
3. M.Gopal, Modern Control System Theory, New Age International Publishers, 2002.

REFERENCE BOOKS:

1. William S Levine, “Control System Fundamentals,” The Control Handbook, CRC Press, Tayler and Francies Group, 2011.
2. Ashish Tewari, ‘Modern Control Design with Matlab and Simulink’, John Wiley, New Delhi, 2002.
3. K. Ogata, ‘Modern Control Engineering’, 4th edition, PHI, New Delhi, 2002.
4. T. Glad and L. Ljung,, “Control Theory –Multivariable and Non-Linear Methods”, Taylor & Francis, 2002.
5. D.S.Naidu, “Optimal Control Systems” First Indian Reprint, CRC Press, 2009.

15EEE113 **POWER QUALITY** **3 0 0 3**

COURSE OBJECTIVE:

To introduce the power quality problem To educate on production of voltages sags, over voltages and harmonics and methods of control. To study overvoltage problems To study the sources and effect of harmonics in power system To impart knowledge on various methods of power quality monitoring.

COURSE OUTCOME:

CO-1: To understand the problems in power distribution namely over voltage reduction and harmonics
CO-2: Learning the methods of controlling the problems arise in the power quality
CO-3: To get a brief insight about the sources of production of voltage sags and interruptions and the ways of controlling it
CO-4: To learn about the sources of production of overvoltage.
CO-5: Learning the various methods to control the over voltage using computer assisted tools
CO-6: To identify the sources of harmonics and understanding the effect of it
CO-7: To learn about the operation of devices used for controlling the harmonics
CO-8: To understand the working principle of power quality measuring equipment and also to learn the mathematical modeling tools to solve the problems on power quality.

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions: Overloading - under voltage - over voltage. Concepts of transients - short duration variations such as interruption - long duration variation such as sustained interruption. Sags and swells - voltage sag - voltage swell - voltage imbalance - voltage fluctuation - power frequency variations. International standards of power quality. Computer Business Equipment Manufacturers Associations (CBEMA) curve.

UNIT II VOLTAGE SAGS AND INTERRUPTIONS 9

Sources of sags and interruptions - estimating voltage sag performance. Thevenin's equivalent source - analysis and calculation of various faulted condition. Voltage sag due to induction motor starting. Estimation of the sag severity - mitigation of voltage sags, active series compensators. Static transfer switches and fast transfer switches.

UNIT III OVERVOLTAGES 9

Sources of over voltages - Capacitor switching – lightning - ferro resonance. Mitigation of voltage swells - surge arresters - low pass filters - power conditioners. Lightning protection – shielding - line 92 arresters - protection of transformers and cables. An introduction to computer analysis tools for transients, PSCAD and EMTP.

UNIT IV HARMONICS 9

Harmonic sources from commercial and industrial loads, locating harmonic sources.Power system response characteristics - Harmonics Vs transients. Effect of harmonics - harmonic distortion - voltage and current distortion - harmonic indices - inter harmonics – resonance. Harmonic distortion evaluation - devices for controlling harmonic distortion - passive and active filters. IEEE and IEC standards.

UNIT V POWER QUALITY MONITORING 9

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – quality measurement equipment - harmonic / spectrum analyzer - flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring.

TOTAL : 45 hours

TEXT BOOKS:

1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.Wayne Beaty, 'Electrical Power Systems Quality' McGraw Hill,2003.(For Chapters1,2,3, 4 and 5).

2. Eswald.F.Fudis and M.A.S.Masoum, "Power Quality in Power System and Electrical Machines," Elseviar Academic Press, 2013.

3. J. Arrillaga, N.R. Watson, S. Chen, 'Power System Quality Assessment', Wiley, 2011.

REFERENCE BOOKS:

1. G.T. Heydt, 'Electric Power Quality', 2nd Edition. (West Lafayette, IN, Stars in a Circle Publications, 1994). (For Chapter 1, 2, 3 and 5)
2. M.H.J Bollen, 'Understanding Power Quality Problems: Voltage Sags and Interruptions', (New York: IEEE Press, 1999). (For Chapters 1, 2, 3 and 5)
3. G.J.Wakileh, "Power Systems Harmonics – Fundamentals, Analysis and Filter Design," Springer 2007. 4. E.Aeha and M.Madrigal, "Power System Harmonics, Computer Modelling and Analysis, " Wiley India, 2012.
5. R.S.Vedam, M.S.Sarma, "Power Quality – VAR Compensation in Power Systems," CRC Press 2013.
6. C. Sankaran, 'Power Quality', CRC press, Taylor & Francis group, 2002.

15EEE114 BIO MEDICAL INSTRUMENTATATION 3 0 0 3

COURSE OBJECTIVE:

To provide an acquaintance of the physiology of the heart, lung, blood circulation andcirculation respiration. Biomedical applications of different transducers used..To introduce the student to the various sensing and measurement devices ofelectrical origin. To provide awareness of electrical safety of medical equipments To provide the latest ideas on devices of non-electrical devices. To bring out the important and modern methods of imaging techniques.. To provide latest knowledge of medical assistance / techniques and therapeutic equipments.

COURSE OUTCOME:

CO-1: Define the base of biopotentials and explain the role of bio potential electrodes.
CO-2: Design and operate biopotential amplifiers.
CO-3: Study about common biomedical signals and distinguish its features.
CO-4: Gain knowledge about the modern ways of imaging techniques.
CO-5: Get familiarize about the medical assistance / techniques and therapeutic equipments.
CO-6: Shape the design of cardiac pacemakers and defibrillators;
CO-7: Explain and contrast measurement principles for blood flow, pressure and volume as well as respiratory variables.
CO-8: Identify, explain and judge patient safety issues related to biomedical instrumentation.

UNIT I PHYSIOLOGY AND TRANSDUCERS 9

Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse –transmitters and neural communication – Cardiovascular system – respiratory system –Basic components of a biomedical system - Transducers – selection criteria – Piezo
electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

UNIT II ELECTRO – PHYSIOLOGICAL MEASUREMENTS 9

Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes -Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers,c hopper amplifiers – Isolation amplifier.ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical

safety in medical environment: shock hazards – leakage current-Instruments for checking safety parameters of biomedical equipments

UNIT III NON-ELECTRICAL PARAMETER MEASUREMENTS 9

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound –Pulmonary function measurements – spirometer – Photo Plethysmography, BodyPlethysmography – Blood Gas analysers : pH of blood –measurement of blood pCO2,pO2, finger-tip oxymeter - ESR, GSR measurements .

UNIT IV MEDICAL IMAGING 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI –Ultrasonography – Endoscopy – Thermography – Different types of biotelemetrysystems and patient monitoring – Introduction to Biometric systems

UNIT V ASSISTING AND THERAPEUTIC EQUIPMENTS 9

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy –Heart – Lung machine – Audio meters – Dialysers – Lithotripsy

TOTAL : 45 hours

TEXT BOOKS

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education, 2002 / PHI.

REFERENCE BOOKS

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. L.A. Geddes and L.E.Baker, 'Principles of Applied Bio-Medical Instrumentation', John Wiley & Sons, 1975.
3. J.Webster, 'Medical Instrumentation', John Wiley & Sons, 1995.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

15EEE115 POWER SYSTEM TRANSIENTS 3 0 0 3

COURSE OBJECTIVE:

To study the generation of switching transients and their control using circuit – theoretical concept. To study the mechanism of lighting strokes and the production of lighting surges.To study the propagation, reflection and refraction of travelling waves. To study the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system.

COURSE OUTCOME:

CO-1: Define Transients, RL, RC, RLC transients, and effects of Power System Transients- switching & lightening transients.

CO-2: Distinguish transients and inter connected in power system.

CO-3: Differentiate switching, lightening, transmission waves on transmission line computation of transients.

CO-4: Illustrate components in power system transients

CO-5: Categorize distributed voltage range and equipment range in power system.

CO-6: Emphasize switching transients, V, I, P measurements after transient period.

CO-7: Interpret design specification based on inter-connected power system and simulation studies

CO-8: Design tools for checking components based on normal abnormal conditions.

UNIT I INTRODUCTION AND SURVEY 9

Review and importance of the study of transients - causes for transients. RL circuit transient with sine wave excitation - double frequency transients - basic transforms of the RLC circuit transients. Different types of power system transients - effect of transients on power systems – role of the study of transients in system planning.

UNIT II SWITCHING TRANSIENTS 9

Over voltages due to switching transients - resistance switching and the equivalent circuit for interrupting the resistor current - load switching and equivalent circuit - waveforms for transient voltage across the load and the switch - normal and abnormal switching transients. Current 86 suppression - current chopping - effective equivalent circuit. Capacitance switching - effect of source regulation - capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients - ferro resonance.

UNIT III LIGHTNING TRANSIENTS 9

Review of the theories in the formation of clouds and charge formation - rate of charging of thunder clouds – mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke - factors contributing to good line design - protection using ground wires - tower footing resistance - Interaction between lightning and power system.

UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 9

Computation of transients - transient response of systems with series and shunt lumped parameters and distributed lines. Traveling wave concept - step response - Bewely's lattice diagram - standing waves and natural frequencies - reflection and refraction of travelling waves.

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault - distribution of voltages in a power system - Line dropping and load rejection - voltage transients on closing and reclosing lines - over voltage induced by faults -switching surges on integrated system Qualitative application of EMTP for transient computation.

TOTAL : 45 hours

TEXT BOOKS:

1. Allan Greenwood, 'Electrical Transients in Power Systems', Wiley Inter Science, New York, 2nd Edition, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in Power System", John Wiley and Sons Inc., Second Edition, 2009.
3. C.S. Indulkar, D.P.Kothari, K. Ramalingam, 'Power System Transients – A statistical approach', PHI Learning Private Limited, Second Edition, 2010.

REFERENCE BOOKS:

1. M.S.Naidu and V.Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, Fifth Edition, 2013.
2. R.D. Begamudre, 'Extra High Voltage AC Transmission Engineering', Wiley Eastern Limited, 1986.
3. Y.Hase, Handbook of Power System Engineering," Wiley India, 2012.
4. J.L.Kirtley, "Electric Power Principles, Sources, Conversion, Distribution and use," Wiley, 2012.

15EEE116 FIBRE OPTICS AND LASER INSTRUMENTS 3 0 0 3

COURSE OBJECTIVE:

To expose the basic concepts of optical fibers and their industrial applications. To provide adequate knowledge about Industrial application of optical fibres. To provide basic concepts of lasers. To provide knowledge about Industrial application of lasers To provide knowledge about Industrial application of Holography and Medical applications of Lasers.

COURSE OUTCOME:

CO-1: Be familiar with and categorize the structures of Optical fiber and types.
CO-2: Confer the channel impairments like losses and dispersion.
CO-3: Investigate various coupling losses.
CO-4: Classify the Optical sources and detectors and to discuss their principle.
CO-5: Familiar with Design considerations of fiber optic systems.
CO-6: 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.
CO-7: Examine the use of optical fibers and lasers in instrumentation
CO-8: Employ Optical fibers for measurement
CO-9: Pertain LASER in Instrumentation and Biomedical applications

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

Principles of light propagation through a fibre - Different types of fibres and their properties, fibre characteristics – Absorption losses – Scattering losses – Dispersion – Connectors and splicers – Fibre termination – Optical sources – Optical detectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBRES 9

Fibre optic sensors – Fibre optic instrumentation system – Different types of modulators – Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Three level and four level lasers – Properties of laser – Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers – Gas lasers, solid lasers, liquid lasers, semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, current, voltage and Atmospheric effect – Material processing – Laser heating, welding, melting and trimming of material – Removal and vaporization.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography – Basic principle - Methods – Holographic interferometry and application, Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser and tissue interactive – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynaecology and oncology.

TOTAL : 45 hours

TEXT BOOKS:

1. R.P.Khare, Fiber Optics and Optoelectronics, Oxford university press, 2008.
2. J. Wilson and J.F.B. Hawkes, Introduction to Opto Electronics, Prentice Hall of India, 2001.

REFERENCE BOOKS:

1. Asu Ram Jha, Fiber Optic Technology Applications to commercial, Industrial, Military and Space Optical systems, PHI learning Private limited, 2009.
2. M. Arumugam, Optical Fibre Communication and Sensors, Anuradha Agencies, 2002.
3. John F. Read, Industrial Applications of Lasers, Academic Press, 1978.

15EEE117 FLEXIBLE AC TRANSMISSION SYSTEMS 3 0 0 3

COURSE OBJECTIVE:

To introduce the reactive power control techniques To educate on static VAR compensators and their applications To provide knowledge on Thyristor controlled series capacitors To educate on STATCOM devices To provide knowledge on FACTS controllers

COURSE OUTCOME:

CO-1: Understand the need of reactive power control in electrical power transmission lines

CO-2: Able to design the Static VAR Compensator (SVC) for power flow and fast transient stability

CO-3: Able to design Thyristor Controlled Series Capacitor (TCSC) for Improvement of the system stability limit – Enhancement of system damping

CO-4: Understand the operation and design of Static Synchronous Compensator (STATCOM)

CO-5: Design of Real and Reactive power Control Components in Power System

CO-6: Able to enhance the Transient Stability of power system

CO-7: Understand the various FACTS Controller interactions

CO-8: Understand the Co-ordination of multiple controllers using linear control techniques

CO-9: Understand the Co-ordination of multiple controllers using genetic algorithms

UNIT I INTRODUCTION 9

Reactive power control in electrical power transmission lines -Uncompensated transmission line - series compensation – Basic concepts of Static Var Compensator (SVC) – Thyristor Controlled Series capacitor (TCSC) – Unified power flow controller (UPFC).

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator –Modelling of SVC for power flow and fast transient stability – Applications: Enhancement of transient stability – Steady state power transfer – Enhancement of power system damping.

UNIT III THYRISTOR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC – Different modes of operation – Modelling of TCSC – Variable reactance model – Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit – Enhancement of system damping

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UNIT IV VOLTAGE SOURCE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM) – Principle of operation – V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability - prevention of voltage instability. SSSC-operation of SSSC and the control of power flow –modelling of SSSC in load flow and transient stability studies.

UNIT V CO-ORDINATION OF FACTS CONTROLLERS 9

Controller interactions – SVC – SVC interaction – Co-ordination of multiple controllers using linear control techniques – Control coordination using genetic algorithms

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TOTAL: 45 hours

TEXT BOOKS:

1. R.Mohan Mathur, Rajiv K.Varma, “Thyristor – Based Facts Controllers for Electrical Transmission Systems”, IEEE press and John Wiley & Sons, Inc, 2002.

2. Narain G. Hingorani, “Understanding FACTS -Concepts and Technology of Flexible AC Transmission Systems”, Standard Publishers Distributors, Delhi- 110 006, 2011.

3. K.R.Padiyar," FACTS Controllers in Power Transmission and Distribution", New Age International(P) Limited, Publishers, New Delhi, 2008.

REFERENCE BOOKS:

1. A.T.John, "Flexible A.C. Transmission Systems", Institution of Electrical and Electronic Engineers (IEEE), 1999.

2. V.K.Sood,HVDC and FACTS controllers – Applications of Static Converters in Power System, APRIL 2004 , Kluwer Academic Publishers, 2004.

3. Xiao – Ping Zang, Christian Rehtanz and Bikash Pal, "Flexible AC Transmission System: Modelling and Control" Springer, 2012

15EEE118 SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL 3 0 0 3

COURSE OBJECTIVE:

To introduce Non parametric methods To impart knowledge on parameter estimation methods To impart knowledge on Recursive identification methods To impart knowledge on Adaptive control schemes To introduce stability, Robustness and Applications of adaptive control method

COURSE OUTCOME:

CO-1: To implement different methodologies for classical system identification
CO-2: Learning the application of various methods for on-line parameter estimation
CO-3: To develop an efficient adaptive control system for linear systems.
CO-4: To learn about the identification methods of control.
CO-5: Learning the prediction error methods of recursive function
CO-6: To analyze the existing methods with respect to stability
CO-7: To learn about the operation of gain scheduling and self-tuning controller
CO-8: To understand the issues involved in adaptive control

UNIT I NON PARAMETRIC METHODS 9

Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis.

UNIT II PARAMETER ESTIMATION METHODS 9

Least square estimation – best linear unbiased estimation under linear constraints – updating the parameter estimates for linear regression models–prediction error methods: description of prediction methods – optimal prediction – relation between prediction error methods and other identification methods – theoretical analysis - Instrumental variable methods: Description of instrumental variable methods – Input signal design for identification.

UNIT III RECURSIVE IDENTIFICATION METHODS 9

The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identifiability considerations – direct identification – indirect identification.

UNIT IV ADAPTIVE CONTROL SCHEMES 9

Introduction – Types of adaptive control–Gain scheduling controller–Model reference adaptive control schemes–Self tuning controller–MRAC and STC: Approaches–The Gradient approach – Lyapunov functions – Passivity theory – pole placement method – Minimum variance control – Predictive control.

UNIT V ISSUES INADAPTIVE CONTROL AND APPLICATIONS 9

Stability – Convergence – Robustness –Applications of adaptive control.

TOTAL: 45 h

TEXT BOOKS:

1. Soder Storm T and Peter Stoica, System Identification, Prentice Hall International,1989.
2. Astrom,K.J. and Wittenmark,B., “Adaptive Control”,Pearson Education, 2 nd Edition, 2001.
3. Sastry,S. and Bodson, M.,“ Adaptive Control– Stability, Convergence and Robustness”, Prentice Hall inc., New Jersey, 1989

REFERENCE BOOKS:

1. Ljung L, System Identification: Theory for the user, Prentice Hall, Engle wood Cliffs,1987.
2. Bela.G.Liptak., “Process Control and Optimization”., Instrument Engineers’ Handbook., volume 2, CRC press and ISA, 2005.
3. William S.Levine, “Control Systems Advanced Methods, the Control Handbook, CRC Press, 2011.

15EEE119 PROFESSIONAL ETHICS IN ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories.

CO-2: Understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO-3: Aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.

CO-4: Acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

CO-5: Understand the core values that shape the ethical behavior of an engineer and Exposed awareness on professional ethics and human values.

CO-6: Know their role in technological development

CO-6: Understand the nature of professional responsibility and be able to identify the ethical elements in decisions.

CO-7: Be able to address and resolve problems arising from questionable practice.

CO-8: Develop critical thinking skills and professional judgement and understand practical difficulties of bringing about change.

CO-9: Develop a professional ethical identity to carry forward in their working life.

UNIT I HUMAN VALUES 10

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

UNIT II ENGINEERING ETHICS 9

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

UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9

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

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 8

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis and Reducing Risk - 105 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 hours

TEXT BOOKS:

1. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003. 2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.

REFERENCE BOOKS:

1. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
2. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, 2009.
3. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003
4. Edmund G Seebauer and Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, 2001.
5. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi, 2013.
6. World Community Service Centre, ‘ Value Education’, Vethathiri publications, Erode, 2011.

15EEE120 POWER SYSTEM DYNAMICS 3 0 0 3

COURSE OBJECTIVE:

To introduce the basics of dynamics and stability problems To educate on modeling of synchronous machines To educate on the excitation system and speed-governing controllers. To study small signal stability of a single-machine infinite bus system with excitation system and power system stabilizer. To educate on the transient stability simulation of multi machine power system.

COURSE OUTCOME:

CO-1: Understand the dynamic modeling of synchronous machine.
CO-2: Understand the modeling of excitation and speed governing system for stability analysis.
CO-3: Attain knowledge about stability of dynamic systems.
CO-4: Understand the significance about small signal stability analysis with controllers.
CO-5: Understand the enhancement of small signal stability.
CO-6: Understand of dynamic model of synchronous machine will be developed.
CO-7: Attain knowledge about the Simulation study of multi-machine dynamic model.
CO-8: Know the concepts of small signal stability.
CO-9: Investigate the different aspect of energy function methods.
CO-5: Attain knowledge about the concept of voltage stability and sensitivity analysis .

UNIT I INTRODUCTION **9**

Basics of system dynamics – numerical techniques – introduction to software packages to study the responses. Concept and importance of power system stability in the operation and design - distinction between transient and dynamic stability - complexity of stability problem in large system – necessity for reduced models - stability of interconnected systems.

UNIT II SYNCHRONOUS MACHINE MODELLING **9**

Synchronous machine - flux linkage equations - Park's transformation - per unit conversion - normalizing the equations - equivalent circuit - current space model - flux linkage state space model. Sub-transient and transient inductances - time constants. Simplified models (one axis and constant flux linkage) - steady state equations and phasor diagrams.

UNIT III MACHINE CONTROLLERS **9**

Exciter and voltage regulators - function and types of excitation systems - typical excitation system configuration - block diagram and state space representation of IEEE type 1 excitation system - saturation function - stabilizing circuit. Function of speed governing systems - block diagram and state space representation of IEEE mechanical hydraulic governor and electrical hydraulic governors for hydro turbines and steam turbines.

UNIT IV TRANSIENT STABILITY **9**

State equation for multi machine system with one axis model and simulation – modelling of multi machine power system with one axis machine model including excitation system and speed governing system and simulation using R-K method of fourth order (Gill's technique) for transient stability analysis - power system stabilizer. For all simulations, the algorithm and flow chart have to be discussed.

UNIT V DYNAMIC STABILITY **9**

System response to small disturbances - linear model of the unregulated synchronous machine and its modes of oscillation - regulated synchronous machine - distribution of power impact - linearization of the load equation for the one machine problem – simplified linear model - effect of excitation on dynamic stability - approximate system representation - supplementary stabilizing signals - dynamic performance measure - small signal performance measures.

TOTAL : 45 hours

TEXT BOOKS:

1. P.M. Anderson and A.A.Fouad, 'Power System Control and Stability', Galgotia Publications, New Delhi, 2003.

2. P. Kundur, 'Power System Stability and Control', McGraw Hill Inc., USA, 1994. 3. R.Ramanujam, "Power System Dynamics – Analysis and Simulation", PHI, 2009.

REFERENCE BOOKS:

1. M.A.Pai and W.Sauer, 'Power System Dynamics and Stability', Pearson Education Asia, India, 2002.
2. James A.Momoh, Mohamed. E. EI-Hawary. " Electric Systems, Dynamics and Stability with Artificial Intelligence applications", Marcel Dekker, USA First Edition, 2000.
3. C.A.Gross, "Power System Analysis," Wiley India, 2011.
4. B.M.Weedy, B.J.Lory, N.Jenkins, J.B.Ekanayake and G.Strbac," Electric Power Systems", Wiley India, 2013.
5. K.Umarao, "Computer Techniques and Models in Power System," I.K. International, 2007.

15EEE121 SOLID STATE DRIVES 3 0 0 3

COURSE OBJECTIVE:

To understand steady state operation and transient dynamics of a motor load system. To study and analyze the operation of the converter/chopper fed dc drive, both qualitatively and quantitatively. To study and understand the operation and performance of AC motor drives. To analyze and design the current and speed controllers for a closed loop solid state DC motor drive.

COURSE OUTCOME:

CO-1: Propose and investigate different control techniques of DC Drive
CO-2: Intend and evaluate different control techniques of AC Drive
CO-3: Choose suitable Special Electrical Drive and apply appropriate control method for the application.
CO-4: Pick a drive for a particular application based on power rating.
CO-5: Select a drive based on mechanical characteristics for a particular drive application.
CO-6: Function and maintain solid state drives for speed control of DC machines.
CO-7: Work and maintain solid state drives for speed control 3 phase induction motor.
CO-8: Operate and maintain solid state drives for speed control of 3 phase Synchronous motor.
CO-9: Activate and maintain solid state drives for speed control of various special electrical machines

UNIT I DRIVE CHARACTERISTICS 9

Electric drive – Equations governing motor load dynamics – steady state stability – multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics – Selection of motor.

UNIT II CONVERTER / CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive– continuous and discontinuous conduction– Time ratio and current limit control – 4 quadrant operation of converter / chopper fed drive.

UNIT III INDUCTION MOTOR DRIVES 9

Stator voltage control–energy efficient drive–v/f control–constant airgap flux–field weakening mode 68 – voltage / current fed inverter – closed loop control.

UNIT IV SYNCHRONOUS MOTOR DRIVES 9

V/f control and self control of synchronous motor: Margin angle control and power factor control – permanent magnet synchronous motor.

UNIT V DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with Current and speed feedback– armature voltage control and field weakening mode – Design of controllers; current controller and speed controller- converter selection and characteristics.

TOTAL: 45 hours

TEXT BOOKS:

1. Gopal K.Dubey, Fundamentals of Electrical Drives, Narosa Publishing House, 1992.
2. Bimal K.Bose. Modern Power Electronics and AC Drives, Pearson Education, 2002.
3. R.Krishnan, Electric Motor & Drives: Modeling, Analysis and Control, Prentice Hall of India, 2001.

REFERENCE BOOKS:

1. John Hindmarsh and Alasdain Renfrew, “Electrical Machines and Drives System,” Elsevier 2012.
2. Shaahin Felizadeh, “Electric Machines and Drives”, CRC Press(Taylor and Francis Group), 2013.
3. S.K.Pillai, A First course on Electrical Drives, Wiley Eastern Limited, 1993.
4. S. Sivanagaraju, M. Balasubba Reddy, A. Mallikarjuna Prasad “Power semiconductor drives” PHI, 5th printing, 2013.
5. N.K.De., P.K.SEN”Electric drives” PHI, 2012. 6. Vedam Subramanyam, ”Thyristor Control of Electric Drives”, Tata McGraw Hill, 2007.

SYLLABUS

GENERIC ELECTIVE COURSES

15EEE151 DIGITAL LOGIC CIRCUITS 3 0 0 3

COURSE OBJECTIVE:

To study various number systems, simplify the logical expression using Boolean functions. To study implementation of combinational circuits.To study the design of various synchronous and asynchronous circuits To introduce asynchronous and sequential circuits and PLC'S

COURSE OUTCOME:

CO-1: Introduce Boolean algebra and understand the correlation and simplification of Boolean expressions.

CO-2: Able to identify, analyze and design combinational circuits.

CO-3: Able to design various synchronous and asynchronous sequential circuits.

CO-4: Acquire knowledge about internal circuitry and logic behind any digital system.

CO-5: Design and implement combinational logic circuits using reprogrammable logic devices.

CO-6: Explain the concept of memories and programmable logic devices.

CO-7: Understand the basics of hardware description languages.

CO-8: Write HDL's for any digital circuit.

UNIT I BOOLEAN ALGEBRA AND COMBINATIONAL CIRCUITS 9

Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method, Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers.

UNIT II SYNCHRONOUS SEQUENTIAL CIRCUITS 9

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits –Counters, state diagram; state reduction; state assignment.

UNIT III ASYNCHRONOUS SEQUENCTIAL CIRCUIT 9

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

UNIT IV PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES 9

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

UNIT V VHDL 9

RTL Design – combinational logic – Types – Operators – Packages – Sequential circuit – Sub programs – Test benches. (Examples: adders, counters, flip flops, FSM, Multiplexers / De mltiplexers)

TOTAL: 45 hours

TEXT BOOKS:

1. Raj Kamal, ' Digital systems-Principles and Design', Pearson education 2nd edition, 2007

2. Morris Mano, M. 'Digital Design', Pearson Education, 2006.

3. John M.Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCE BOOKS:

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.

2. Floyd and Jain, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.

3.John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

4. Tocci, “Digital Systems : Principles and aopplications, 8th Edition” Pearson Education.

DATA STRUCTURES USING C++ 3 0 0 3

15EEE152

COURSE OBJECTIVE:

To explain the basic data structures and its operations To explain the concept of time complexity and space complexity. To identify an appropriate data structure for a problem. To make use of basic data structures to solve problems. To summarize various searching and sorting algorithms.

COURSE OUTCOME:

CO-1: To be able to choose appropriate data structure as applied to specified problem definition..

CO-2: To clearly be able to handle operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

CO-3: To able to apply concepts learned in various domains like DBMS, compiler construction etc..

CO- 4: To be able to use linear and non-linear data structures like stacks, queues, linked list etc.

CO-5: To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

CO-6: To have knowledge of tree and graphs concepts.

CO-7: To understand concepts about searching and sorting techniques

UNIT I PRINCIPLES OF OBJECT ORIENTED PROGRAMMING 9

Software crisis Software Evolution - Procedure Oriented Programming - Object Oriented Programming paradigm - Basic concepts and benefits of OOP - Object Oriented Language - Application of OOP - Structure of C++ - Applications of C++ - Tokens, Expressions and Control Structures - Operators in C++ - Manipulators.

UNIT II FUNCTIONS IN C++ 9

Function Prototyping - Call by Reference - Return by reference - Inline functions - Default, Const Arguments - Function - Overloading - Friend and Virtual Functions - Classes and Objects - Member functions - Nesting of Member functions - Private member functions - Memory allocation for Objects - Static data members - Static Member Functions - Arrays of Objects - Objects as Function - Arguments - Friendly Functions - Returning Objects - Const Member functions - Pointers to Members.

UNIT III CONSTRUCTORS AND INHERITANCE 9

Parameterized Constructors - Multiple Constructors in a Class - Constructors with Default Arguments - Dynamic Initialization of Objects - Copy and Dynamic Constructors – Destructors overloading - Overloading Unary and Binary Operators - Overloading Binary Operators using Friend functions.
Abstract Classes - Constructors in Derived Classes - Member Classes - Nesting of Classes.

UNIT IV DATA STRUCTURES, ARRAYS AND STACKS 9

Abstract data Types - Primitive data structures - Analysis of algorithms - Best, worst and average case time complexities - Notation. Arrays - Operations - Implementation of one, two, three and multi dimensioned arrays – Sparse and dense matrices - Applications. Stacks - Primitive operations - Sequential implementation - Applications: Subroutine handling - Recursion.

UNIT V QUEUES AND LISTS **9**

Queues - Primitive operations - Sequential implementation - Dequeues - Applications: Image component labeling; Machine shop simulation.

Lists- Primitive Operations - Singly linked lists, Doubly linked lists, Circular lists, Multiply linked lists - Applications Addition of Polynomials; Sparse Matrix representation and Operations. – Linked Stacks - Linked queues.

TOTAL: 45 hours

TEXT BOOKS:

1. Bjarne Stroustrup, “The C++ Programming Language”, Pearson Education, 2001.
2. Stanley B Lippman and Josee Lajoie, “The C++ Primer”, Pearson Education, 2001.
3. Yedidyah Langsam, Moshe J Augenstein and Aaron M Tenenbaum , “ Data Structures Using C and C++ “, Prentice Hall of India, 2001

.

REFERENCE BOOKS:

1. Horowitz, Sahni and Meheta D, "Fundamentals of Data Structures in C++”, Computer science press, 1995.
2. Deital and Deital, “C++ How to program”, Prentice Hall, 2001.
3. Ganesh S G, “60 tips on Object Oriented Programming”, Tata McGraw-Hill, New Delhi, 2008

15EEE153 COMMUNICATION ENGINEERING 3 0 0 3

COURSE OBJECTIVE:

To introduce different methods of analog communication and their significance. To introduce Digital Communication methods for high bit rate transmission. To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission. To introduce MAC used in communication systems for enhancing the number of users. To introduce various media for digital communication.

COURSE OUTCOME:

CO-1: Understand the importance of modulation in communication

CO -2: Know and differentiate the concepts of amplitude, frequency and phase modulation.

CO -3: Know the concept of channel capacity in digital communication

CO- 4: Understand the transmission, bit error rate, baud and bandwidth of FSK.

CO -5: Know the different types of source and error control codes.

CO -6: Understand the various multiple access techniques like TDMA, FDMA, CDMA and SDMA.

CO -7: Understand satellite communication and how MA techniques are used in satellite communication.

CO -8: Understand the concepts of communication using optical fibers.

UNIT I FUNDAMENTALS OF ANALOG COMMUNICATION 9

Principles of amplitude modulation, AM envelope, frequency spectrum and bandwidth, modulation index and percent modulation, AM Voltage distribution, AM power distribution, Angle modulation - FM and PM waveforms, phase deviation and modulation index, frequency deviation and percent modulation, Frequency analysis of angle modulated waves. Bandwidth requirements for Angle modulated waves.

UNIT II DIGITAL COMMUNICATION 9

Introduction, Shannon limit for information capacity, digital amplitude modulation, frequency shift keying, FSK bit rate and baud, FSK transmitter, BW consideration of FSK, FSK receiver, phase shift keying – binary phase shift keying – carrier recovery – squaring loop, Costas loop, DPSK.

UNIT III SOURCE CODES, LINE CODES & ERROR CONTROL 9

Primary communication – entropy, properties, BSC, BEC, source coding : Shaum, Fao, Huffman coding : noiseless coding theorem, BW – SNR trade off codes: NRZ, RZ, AMI, HDBP, ABQ, MBnB codes : Efficiency of transmissions, error control codes and applications: convolutions & block codes.

UNIT IV MULTIPLE ACCESS TECHNIQUES 9

SS&MA techniques: FDMA, TDMA, CDMA, SDMA application in wire and wireless communication: Advantages (merits).

UNIT V SATELLITE, OPTICAL FIBER 9

Orbits: types of satellites: frequency used link establishment, MA techniques used in satellite communication, earth station; aperture actuators used in satellite – Intelsat and Insat: fibers – types: sources, detectors used, digital filters, optical link. **TOTAL: 45 hours**

TEXT BOOKS:

1. Wayne Tomasi, “Advanced Electronic Communication Systems”, **5**/e, Pearson Education, 2007.
2. Simon 2.Haykin, “Digital Communications”, John Wiley, 2006.

REFERENCE BOOKS:

1. Kennedy and Davis “Electronic communication systems” Tata McGraw hill, 4th edition, 1993.
2. Sklar “Digital communication fundamentals and applications“ Pearson Education, 2001
3. Baryle, Memuschmidt, digital Communication, Kluwer Publication, 2004.
4. B.P.Lathi “Modern digital and analog communication systems” Oxford University Press, 1998.
5. Dennis Roddy “Satellite Communications” Tata McGraw hill, 4th edition, 2009.

15EEE154 PRINCIPLES OF MANAGEMENT & PROFESSIONAL ETHICS 3 0 0 3

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Understand the basic perception of profession, professional ethics, various moral & social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
CO-2: Awareness about professional rights and responsibilities of an engineer
CO-3: Responsibilities of an engineer for safety and risk benefit analysis.
CO-4: Acquire knowledge about various roles of engineers in variety of global issues
CO-5: Ability to apply ethical principles to resolve situations that arise in their professional lives.
CO-6: Explain strategic management in business operations
CO-7: Define management, quality management, and project management.
CO-8: Identify relevant issues in human resource management.

UNIT I OVERVIEW OF MANAGEMENT 9

Definition - Management - Role of managers - Evolution of Management thought – Organization and the environmental factors – Trends and Challenges of Management in Global Scenario.

UNIT II PLANNING & ORGANIZING 9

Nature and purpose of planning and Organizing - Planning process - Types of plans – Managing by objective (MBO) Strategies - Types of strategies - Policies - Decision Making - Types of decision - Decision Making Process - Rational Decision Making Process - Decision Making under different conditions. - Organization structure - Formal and informal groups I organization - Line and Staff authority - Departmentation - Span of control - Centralization and Decentralization - Delegation of authority - Staffing - Selection and Recruitment - Orientation - Career Development - Career stages – Training - Performance Appraisal.

UNIT III DIRECTING & CONTROLLING 9

Creativity and Innovation - Motivation and Satisfaction - Motivation Theories - Leadership Styles - Leadership theories - Communication - Barriers to effective communication – Organization Culture - Elements and types of culture - Managing cultural diversity. Process of controlling - Types of control - Budgetary and non-budgetary control techniques - Managing Productivity - Cost Control - Purchase Control - Maintenance Control - Quality Control - Planning operations.

UNIT IV ENGINEERING ETHICS & HUMAN VALUES 9

Definition - Societies for engineers – Code of Ethics – Ethical Issues involved in cross border research - Ethical and Unethical practices – case studies – situational decision making - 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 V 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 – Global issues - Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership –Code of Conduct – Corporate Social Responsibility.

TOTAL: 45 hours

TEXT BOOKS:

1. Stephen P. Robbins and Mary Coulter, 'Management', Prentice Hall of India, 8th edition.
2. Charles W L Hill, Steven L McShane, 'Principles of Management', Mcgraw Hill Education, Special Indian Edition, 2007.
3. Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, Tata McGraw Hill, New Delhi, 2003.

REFERENCE BOOKS:

1. Hellriegel, Slocum & Jackson, ' Management - A Competency Based Approach', Thomson South Western, 10th edition, 2007.
2. Harold Koontz, Heinz Weihrich and Mark V Cannice, 'Management - A global & Entrepreneurial Perspective', Tata Mcgraw Hill, 12th edition, 2007.
3. Andrew J. Dubrin, 'Essentials of Management', Thomson Southwestern, 7th edition, 2007.
4. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, 2004.
5. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, 2003

15EEE155 TOTAL QUALITY MANAGEMENT 3 0 0 3

COURSE OBJECTIVE:

To facilitate the understanding of Quality Management principles and process.

COURSE OUTCOME:

CO-1: Well versed in the Basics of Total Quality Management.

CO-2: Know the role of the management and leadership in an Organisation

CO-3: Know how to manage the customer needs according to the Quality.

CO-4: Apply various quality improvement techniques.

CO-5: Improve the quality using the seven traditional tools and Techniques.

CO-6: Understand about the loss function using the Taguchi quality loss function

CO-7: Extend a strategy for implementing TQM in an organization

CO-8: Know the selectivity and usage of appropriate tools and techniques for controlling, improving and measuring quality..

CO-9: Understand the need and requirements of Quality Documentation, Auditing and its Standards,

CO-10: Make clear about the Implementation of Quality systems in the Manufacturing and service sectors.

UNIT I INTRODUCTION 9

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

UNIT II TQM PRINCIPLES 9

Leadership - Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Quality circles Recognition and Reward, Performance appraisal 106 - Continuous process improvement - PDCA cycle, 5S, Kaizen - Supplier partnership - Partnering, Supplier selection, Supplier Rating.

UNIT III TQM TOOLS AND TECHNIQUES I **9**

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

UNIT IV TQM TOOLS AND TECHNIQUES II 9

Control Charts - Process Capability - Concepts of Six Sigma - Quality Function Development (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.

UNIT V QUALITY SYSTEMS 9

Need for ISO 9000 - ISO 9001-2008 Quality System - Elements, Documentation, Quality Auditing - QS 9000 - ISO 14000 - Concepts, Requirements and Benefits - TQM Implementation in manufacturing and service sectors.

TOTAL: 45 hours

TEXT BOOK:

1. Dale H. Besterfiled, et at., "Total quality Management", Pearson Education Asia, Third Edition, Indian Reprint,2006.

REFERENCE BOOKS:

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First IndianEdition, Cengage Learning, 2012.

2. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

3. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd.,2006.

15EEE156 EMBEDDED SYSTEMS 3 0 0 3

COURSE OBJECTIVE:

To introduce the Building Blocks of Embedded System. To Educate in Various Embedded Development Strategies. To Introduce Bus Communication in processors, Input/output interfacing. To impart knowledge in Various processor scheduling algorithms. To introduce Basics of Real time operating system and example tutorials to discuss on one realtime operating system tool.

COURSE OUTCOME:

CO-1: To learn the structural units of embedded systems and the uses of Timers, Clock and counters

CO-2: Learning the methods of debugging an embedded device.

CO-3: To get a brief insight about the input and output ports of an embedded device

CO-4: To learn about the various protocols to establish communication between the embedded devices.

CO-5: Learning the different stages involved in the development of an embedded product and various models in it.

CO-6: To learn in detail about the difference between an operating system and real time operating systems (RTOS)

CO-7: To learn about the features in RTOS and various RTOS available in the embedded market

CO-8: To do a case study on the working of washing machine to learn about the real time application of the embedded hardware and software

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Introduction to Embedded Systems – The build process for embedded systems- Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management 69 methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses– Serial Bus communication protocols - RS232 standard – RS422 – RS485 - CAN Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) – need for device drivers.

UNIT III EMBEDDED FIRMWARE DEVELOPMENT ENVIRONMENT 9

Embedded Product Development Life Cycle- objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co-design, Data Flow Graph, state machine model, Sequential Program Model, concurrent Model, object oriented Model.

UNIT IV RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multiprocessing and Multitasking, Preemptive and non-preemptive scheduling, Task communicationshared memory, message passing-, Inter process Communication – synchronization between processes-semaphores, Mailbox, pipes, priority inversion, priority inheritance, comparison of Real time Operating systems: Vx Works, чC/OS-II, RT Linux.

UNIT V EMBEDDED SYSTEM APPLICATION DEVELOPMENT 9

Case Study of Washing Machine- Automotive Application- Smart card System Application,.

TOTAL: 45 hours

TEXT BOOKS:

1. Rajkamal, 'Embedded System-Architecture, Programming, Design', Mc Graw Hill, 2013.
2. Peckol, "Embedded system Design", John Wiley & Sons,2010
3. Lyla B Das," Embedded Systems-An Integrated Approach", Pearson, 2013

REFERENCE BOOKS:

1. Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2. Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning,2009. 5. Rajib Mall "Real-Time systems Theory and Practice" Pearson Education, 2007

15EEE157 ADVANCED DIGITAL SIGNAL PROCESSING 3 0 0 3

COURSE OBJECTIVE:

To bring out the concepts related to stationary and non-stationary random signals. To emphasize the importance of true estimation of power spectral density. To introduce the design of linear and adaptive systems for filtering and linear prediction. To introduce the concept of wavelet transforms in the context of image processing.

COURSE OUTCOME:

CO-1: Acquired knowledge about discrete random process and their properties.

CO-2: Ability to understand the Filtering random processes, ARMA, AR and MA processes.

CO-3: Describe the statistical properties of the conventional spectral estimators.

CO-4: Quickly select the better algorithms for spectral estimation.

CO-5: Select linear filtering techniques to engineering problems.

CO-6: Describe the most important adaptive filter generic problems.

CO-7: Describe the various adaptive filter algorithms.

CO-8: Understand Continuous and discrete wavelet transform and apply the wavelet transforms for various applications.

UNIT I DISCRETE-TIME RANDOM SIGNALS 9

Discrete random process – Ensemble averages, Stationary and ergodic processes, Autocorrelation and Autocovariance properties and matrices, White noise, Power Spectral Density, Spectral Factorization, Innovations Representation and Process, Filtering random processes, ARMA, AR and MA processes.

UNIT II SPECTRUM ESTIMATION 9

Bias and Consistency, Periodogram, Modified periodogram, Blackman-Tukey method, Welch method, Parametric methods of spectral estimation, Levinson-Durbin recursion.

UNIT III LINEAR ESTIMATION AND PREDICTION 9

Forward and Backward linear prediction, Filtering - FIR Wiener filter- Filtering and linear prediction, non-causal and causal IIR Wiener filters, Discrete Kalman filter.

UNIT IV ADAPTIVE FILTERS 9

Principles of adaptive filter – FIR adaptive filter – Newton's Steepest descent algorithm – LMS algorithm – Adaptive noise cancellation, Adaptive equalizer, Adaptive echo cancellers.

UNIT V WAVELET TRANSFORM 9

Multiresolution analysis, Continuous and discrete wavelet transform, Short Time Fourier Transform, Application of wavelet transform, Cepstrum and Homomorphic filtering.

TOTAL: 45 hours

TEXT BOOKS:

1. Monson H, Hayes, "Statistical Digital Signal Processing and Modeling", John Wiley and Sons Inc., New York, Indian Reprint, 2007.

2. John G.Proakis, Dimitris G. Manolakis, "Digital Signal Processing", Pearson, Fourth, 2007.

3. Dwight F. Mix, "Random Signal Processing", Prentice Hall, 1995.

REFERENCE BOOKS:

1. Sophocles J. Orfanidis, "Optimum Signal Processing, An Introduction", McGraw Hill, 1990.

15EEE158 FUNDAMENTALS OF NANOSCIENCE 3 0 0 3

COURSE OBJECTIVE:

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

COURSE OUTCOME:

CO-1: Learn the classification of the Nanostructured materials and their properties in detail

CO-2: Identify the various methods of preparation of nanostructured products.

CO-3: Get a brief insight about the nanotubes and Nano metal oxides

CO-4: Learn the properties and application of Nano clays

CO-5: Know the various methods used for analyses of the nano particles

CO-6: Well versed about the Nano biotechnology and the probes used in it

CO-7: Familiar with the various production of Nano sensors and applications of them.

UNIT I INTRODUCTION 9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and EngineeringClassifications 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 9

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube, Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes, Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, 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 9

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

TOTAL : 45 hours

TEXT BOOKS :

1. A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.

2. N John Dinardo, “Nanoscale Charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.

REFERENCE BOOKS:

1. G Timp, “Nanotechnology”, AIP press/Springer, 1999.

2. Akhlesh Lakhtakia,“The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. Prentice-Hall of India (P) Ltd, New Delhi, 2007.

15EEE159 MICRO ELECTRO MECHANICAL SYSTEMS 3 0 0 3

COURSE OBJECTIVES:

To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices, To educate on the rudiments of Micro fabrication techniques, To introduce various sensors and actuators ,To introduce different materials used for MEMS& To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

COURSE OUTCOME:

CO-1: Understand the concept of micro fabrication and the process involved in it

CO-2: Learn the electrical and mechanical techniques used in the MEMS technology.

CO-3: Get a brief insight about the various sensors and actuators available in the market manufactured using MEMS technology

CO-4: Acquired knowledge about about the micro grippers and micro motors.

CO-5: Know about the piezoelectric materials and the manufacturing of piezoelectric sensors

CO-6: Familiar with the various applications of flow sensors and acoustic sensor.

CO-7: Know about the process of etching to produce structures using micromachining process

CO-8: Understand the various polymers used in the MEMS technology

UNIT I INTRODUCTION 9

Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication - Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis – Flexural beam bending- Torsional deflection.

UNIT II SENSORS AND ACTUATORS-I 9

Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro Motors - Thermal Sensing and Actuation – Thermal expansion – Thermal

couples – Thermal resistors – Thermal Bimorph - Applications – Magnetic Actuators – Micromagnetic components – Case studies of MEMS in magnetic actuators- Actuation using Shape Memory Alloys.

UNIT III SENSORS AND ACTUATORS-II 9

Piezoresistive sensors – Piezoresistive sensor materials - Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT IV MICROMACHINING 9

Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies - Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods – LIGA Process - Assembly of 3D MEMS – Foundry process. 97

UNIT V POLYMER AND OPTICAL MEMS 9

Polymers in MEMS– Polimide - SU-8 - Liquid Crystal Polymer (LCP) – PDMS – PMMA – Parylene – Fluorocarbon - Application to Acceleration, Pressure, Flow and Tactile sensors- Optical MEMS – Lenses and Mirrors – Actuators for Active Optical MEMS.

TOTAL : 45 hours

TEXT BOOKS:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

REFERENCES:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005. 5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.

15EEE160 DISCRETE TIME SYSTEMS AND SIGNAL PROCESSING 3 0 0 3

COURSE OBJECTIVES:

To classify signals and systems & their mathematical representation, To analyze the discrete time systems. To study various transformation techniques & their computation, To study about filters and their design for digital implementation & To study about a programmable digital signal processor & quantization effects.

COURSE OUTCOME:

CO-1: Gain the knowledge about continuous and discrete time signals.

CO-2: Ability to identify LTI & non-linear time-varying systems.

CO-3: Acquired knowledge about discrete-time sequences, concept of energy and power, periodicity

CO-4: Foster ability to work using Laplace Transform and DTFT.

CO-5: Use FFTs for efficient implementation of linear convolution

CO-6: Acquired knowledge about DFT, FFT and IFFT

CO-7: Ability to design linear digital filters both FIR and IIR using different techniques and their associated structures

CO-9: Learn the architecture details and instruction sets of fixed and floating point DSPs

CO-9: Learn the DSP programming tools and use them for applications

CO-10: Illustrate the features of on-chip peripheral devices and its interfacing along with its programming details.

CO-11: Excel in fields such as speech processing, audio signal processing, digital image processing, video and audio compression.

UNIT I INTRODUCTION 9

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquist rate, aliasing effect.

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation – Solution by ztransform,application to discrete systems - Stability analysis, frequency response – Convolution – Discrete TimeFourier transform , magnitude and phase representation.

UNIT III DISCRETE FOURIER TRANSFORM & COMPUTATION 9

Discrete Fourier Transform- properties, magnitude and phase representation - Computation of DFT using FFT algorithm – DIT &DIF using radix 2 FFT – Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization – Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. Analog filter design – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation - mWarping, pre warping.

UNIT V DIGITAL SIGNAL PROCESSORS 9

Introduction – Architecture – Features – Addressing Formats – Functional modes - Introduction to Commercial DSProcessors.

TOTAL : 45 hours

TEXT BOOKS:

1. J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI. 2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Robert Schilling & Sandra L.Harris, Introduction to Digital Signal Processing using Matlab", Cengage Learning,2014.

REFERENCES:

1. Poorna Chandra S, Sasikala. B ,Digital Signal Processing, Vijay Nicole/TMH,2013.
2. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford University Press, 2010
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
4. Sen M.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture, Implementations & Applications, Pearson,2013
5. Dimitris G.Manolakis, Vinay K. Ingle, applied Digital Signal Processing,Cambridge,2012
6. Lonnie C.Ludeman ,"Fundamentals of Digital Signal Processing",Wiley,2013

15EEE161 ROBOTICS AND AUTOMATION 3 0 0 3

COURSE 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.

COURSE OUTCOME:

CO-1: Understand the basics of Robotics and Automation in the context using Robotic products
CO-2: Understand the usage of Software and Programming in the designing of Robots
CO-3: Elucidate the Merits and Demerits of Automation.
CO-4: Ability to compute the Kinematics and Jacobian for series and parallel robots.
CO-5: Compute and locate the possible errors in the Design considerations.
CO-5: Acquire Knowledge about the application of Actuators, Manipulators and grippers.
CO-6: Ability to express the machine interfacing in the design aspects.
CO-7: Analyze robot Forward and Inverse kinematic calculations for a given study
CO-8: Ability in the selectivity of sensors in the automation process

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 hours

TEXT BOOKS

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-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. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. Mc Kerrow P.J. Introduction to Robotics, Addison Wesley, USA, 1991. 5. Issac Asimov I Robot, Ballantine Books, New York, 1986.

15EEE162 DIGITAL SYSTEM DESIGN 3 0 0 3

COURSE OBJECTIVE:

To Design and evaluate the control and data structures for digital systems and to study basic building blocks of both combinational and sequential circuits .

COURSE OUTCOME:

CO-1: Discriminate between combinatorial and sequential circuits.
CO-2: Describe the operation and timing constraints for latches and registers.
CO-3: Design state machines to control complex systems.
CO-4: Define and describe digital design flows for system design and recognize the trade-offs involved in different approaches.

CO-5: Write synthesizable verilog.

CO-6: Write a verilog test bench to test verilog modules.

CO- 7: Analyze code coverage of a verilog test bench.

CO- 8: Target a verilog design to an FPGA board

CO-8: Analyze and debug verilog modules.

CO-9: Build a synchronous DSP system in verilog and verify its performance

UNIT 1 INTRODUCTION TO VHDL **9**

Introduction to VHDL, design units, data objects, signal drivers, inertial and transport delays, delta delay, VHDL data types, concurrent and sequential statements.

UNITII SUBPROGRAMS 9

Subprograms – Functions, Procedures, attributes, generio, generate, package, IEEE standard logic library, file I/O, test bench, component declaration, instantiation, configuration.

UNIT III DESIGN OF COMBINATIONAL LOGIC CIRCUIT 9

Combinational logic circuit design and VHDL implementation of following circuits – first adder, Subtractor, decoder, encoder, multiplexer, ALU, barrel shifter, 4X4 key board encoder, multiplier, divider, Hamming code encoder and correction circuits.

UNIT IV SYNCHRONOUS SEQUENTIAL CIRCUITS DESIGN **9**

Synchronous sequential circuits design – finite state machines, Mealy and Moore, state assignments, design and VHDL implementation of FSMs, Linear feedback shift register (Pseudorandom and CRC)

UNIT V SYNCHRONOUS SEQUENTIALCIRCUITS DESIGN **9**

Asynchronous sequential circuit design – primitive flow table, concept of race, critical race and hazards, design issues like metastability, synchronizers, clock skew and timing considerations.

TOTAL: 45hours

TEXT BOOKS

1. Morris Mano, M. ‘Digital Design’, Pearson Education, 2006.

2. John M.Yarbrough, ‘Digital Logic, Application & Design’, Thomson, 2002.

REFERENCE BOOKS:

1.John F.Wakerly, ‘Digital Design Principles and Practice’, 3rd edition, Pearson Education, 2002.

2 Tocci, “Digital Systems : Principles and aopplications, 8th Edition” Pearson Education.

15EEE163 VLSI DESIGN 3 0 0 3

COURSE OBJECTIVES:

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

COURSE OUTCOME:

CO-1: Well versed in CMOS technology.
CO-2: Draw the CMOS Layout as well as stick diagram with design rules.
CO-3: Understand the Delay and power dissipation concepts.
CO-4: Explain the differences between device characterization and circuit characterization.
CO-5: Understand the Circuit families and Low power logic design.
CO-6: Understand the combinational and sequential circuit design techniques.
CO-7: Clearly explain the concept of various types of Testing Techniques.
CO-8: Understand the concept of logic verification and silicon debug principles.
CO-9: Well versed with Verilog HDL programming.

UNIT I CMOS TECHNOLOGY 9

A brief History-MOS transistor, Ideal I-V characteristics, C-V characteristics, Non ideal IV effects, DC transfer characteristics - CMOS technologies, Layout design Rules, CMOS process enhancements, Technology related CAD issues, Manufacturing issues

UNIT II CIRCUIT CHARACTERIZATION AND SIMULATION 9

Delay estimation, Logical effort and Transistor sizing, Power dissipation, Interconnect, Design margin, Reliability, Scaling- SPICE tutorial, Device models, Device characterization, Circuit characterization, Interconnect simulation

UNIT III COMBINATIONAL AND SEQUENTIAL CIRCUIT DESIGN 9

Circuit families –Low power logic design – comparison of circuit families – Sequencing static circuits, circuit design of
latches and flip flops, Static sequencing element methodology- sequencing dynamic circuits – synchronizers

UNIT IV CMOS TESTING 9

Need for testing- Testers, Text fixtures and test programs- Logic verification- Silicon debug principles- Manufacturing test – Design for testability – Boundary scan

UNIT V SPECIFICATION USING VERILOG HDL 9

Basic concepts- identifiers- gate primitives, gate delays, operators, timing controls, procedural assignments conditional statements, Data flow and RTL, structural gate level switch level modeling, Design hierarchies, Behavioral and RTL modeling, Test benches, Structural gate level description of decoder, equality detector, comparator, priority encoder, half adder, full adder, Ripple carry adder, D latch and D flip flop.

TOTAL: 45 hours

TEXT BOOKS:

1. Weste and Harris: CMOS VLSI DESIGN (Third edition) Pearson Education, 2005
2. Uyemura J.P: Introduction to VLSI circuits and systems, Wiley 2002.

REFERENCES:

1. D.A Pucknell & K.Eshraghian Basic VLSI Design, Third edition, PHI, 2003
2. Wayne Wolf, Modern VLSI design, Pearson Education, 2003
3. M.J.S.Smith: Application specific integrated circuits, Pearson Education, 1997
4. J.Bhasker: Verilog HDL primer, BS publication,2001
5. Ciletti Advanced Digital Design with the Verilog HDL, Prentice Hall of India.

15EEE164 APPLIED SOFT COMPUTING 3 0 0 3

COURSE OBJECTIVES:

To expose the students to the concepts of feed forward neural networks. To provide adequate knowledge about feedback neural networks ,To provide adequate knowledge about fuzzy and neuro-fuuzy systems, To provide comprehensive knowledge of fuzzy logic control to real time systems & To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.

COURSE OUTCOME:

CO-1: Understand Fuzzy Logic, Various fuzzy systems and their functions
CO-2: Familiar with the various Fuzzy models
CO-3: Know the various optimization techniques
CO-4: Well versed in different genetic algorithms
CO-5: Get thorough knowledge in fundamentals of artificial intelligence
CO -6: Know in detail about concepts production systems, characteristics of production systems.
CO-7: Familiar with adaptive neuro fuzzy interference system with its architecture and algorithms
CO-8: Clearly know about various applications of computational intelligence.

UNIT I ARCHITECTURES – ANN 9

Introduction – Biological neuron – Artificial neuron – Neuron model – Supervised and unsupervised learning- Single layer – Multi layer feed forward network – Learning algorithm- Back propagation network.

UNIT II NEURAL NETWORKS FOR CONTROL 9

Feedback networks – Discrete time Hopfield networks – Transient response of continuous time system – Applications of artificial neural network - Process identification – Neuro controller for inverted pendulum.

UNIT III FUZZY SYSTEMS 9

Classical sets – Fuzzy sets – Fuzzy relations – Fuzzification – Defuzzification – Fuzzy rules - Membership function – Knowledge base – Decision-making logic – Introduction to neuro fuzzy system- Adaptive fuzzy system.

UNIT IV APPLICATION OF FUZZY LOGIC SYSTEMS 9

Fuzzy logic control: Home heating system - liquid level control - aircraft landing- inverted pendulum – fuzzy PID control, Fuzzy based motor control.

UNIT V GENETIC ALGORITHMS 9

Introduction-Gradient Search – Non-gradient search – Genetic Algorithms: binary and real representation schemes, selection methods, crossover and mutation operators for binary and real coding - constraint handling methods – applications to economic dispatch and unit commitment problems.

TOTAL: 45 hours

TEXT BOOKS:

1. Laurance Fausett, Englewood cliffs, N.J., 'Fundamentals of Neural Networks',Pearson Education, 1992.
2. Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 1997.
3. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2nd Edition, 2013.

REFERENCES:

1. Simon Haykin, 'Neural Networks', Pearson Education, 2003.
2. John Yen & Reza Langari, 'Fuzzy Logic – Intelligence Control & Information', Pearson Education, New Delhi, 2003.
3. M.Gen and R,Cheng, Genetic algorithms and Optimization, Wiley Series in Engineering Design and Automation, 2000.
4. Hagan, Demuth, Beale, " Neural Network Design", Cengage Learning, 2012.
5. N.P.Padhy, " Artificial Intelligence and Intelligent Systems", Oxford, 2013.
6. William S.Levine, "Control System Advanced Methods," The Control Handbook CRC Press, 2011.

15EEE165 MICROCONTROLLER BASED SYSTEM DESIGN 3 0 0 3

COURSE OBJECTIVES:

To introduce the architecture of PIC microcontroller , To educate on use of interrupts and timers , To educate on the peripheral devices for data communication and transfer,To introduce the functional blocks of ARM processor & To educate on the architecture of ARM processors

COURSE OUTCOME:

CO-1: Acquired knowledge about the architecture of PIC Microcontroller Series.
CO-2: Ability to write Assembly Language Programming of PIC Microcontroller for various applications.
CO-3: Ability to apply knowledge of mathematics, engineering to understand concepts in microcontroller based system

CO-4 Ability to analyze a problem and formulate appropriate computing solution for microcontroller based applications.

CO-5: Build hardware that interfaces an embedded microcontroller to various peripheral devices such as displays, analog, and digital circuitry.

CO-6: Program this system using its interrupt, timer/counter, analog to digital converter, and serial communication facilities.

CO-7: In depth knowledge in the architecture ARM processor.

CO-8: Ability to apply knowledge of ARM processor for writing Assembly Language Programming for several applications.

CO-9: The course would enable students to enrich their knowledge with hands on experiments and project based learning.

UNIT I INTRODUCTION TO PIC MICROCONTROLLER 9

Introduction to PIC Microcontroller–PIC 16C6x and PIC16C7x Architecture–PIC16cxx–- Pipelining - Program Memory considerations – Register File Structure - Instruction Set - Addressing modes – Simple Operations.

UNIT II INTERRUPTS AND TIMER 9

PIC micro controller Interrupts- External Interrupts-Interrupt Programming–Loop time subroutine - Timers-Timer Programming– Front panel I/O-Soft Keys– State machines and key switches– Display of Constant and Variable strings.

UNIT III PERIPHERALS AND INTERFACING 9

I2C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM—Analog to 98 Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization - LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT IV INTRODUCTION TO ARM PROCESSOR 9

ARM Architecture –ARM programmer's model –ARM Development tools- Memory Hierarchy –ARM Assembly Language Programming–Simple Examples–Architectural Support for Operating systems.

UNIT V ARM ORGANIZATION 9

3-Stage Pipeline ARM Organization– 5-Stage Pipeline ARM Organization–ARM Instruction Execution- ARM Implementation– ARM Instruction Set– ARM coprocessor interface– Architectural support for High Level Languages – Embedded ARM Applications.

TOTAL: 45 hours

TEXT BOOKS:

1. Peatman,J.B., "Design with PIC Micro Controllers"PearsonEducation,3rdEdition, 2004.

2. Furber,S., "ARM System on Chip Architecture" Addison Wesley trade Computer Publication, 2000.

REFERENCE:

1. Mazidi, M.A.,"PIC Microcontroller" Rollin Mckinlay, Danny causey Printice Hall of India, 2007.

15EEE166 NEURAL NETWORKS AND FUZZY SYSTEMS 3 0 0 3

COURSE OBJECTIVE:

To cater the knowledge of Neural Networks and Fuzzy Logic Control and use these for controlling real time systems.

COURSE OUTCOME:

CO-1: Understand Fuzzy Logic, Various fuzzy systems and their functions
CO-2: Familiar with the various Fuzzy models
CO-3: Know the various optimization techniques
CO-4: Well versed in different genetic algorithms
CO-5: Get thorough knowledge in fundamentals of artificial intelligence
CO-6: Know in detail about concepts production systems, characteristics of production systems.
CO-7: Familiar with adaptive neuro fuzzy interference system with its architecture and algorithms
CO-8: Clearly know about various applications of computational intelligence

UNIT I ARTIFICIAL NEURAL NETWORKS 9

Introduction to Artificial Neural Networks-Fundamental concepts, weights, biases and thresholds-Artificial models-Linear capability-Common activation functions-Learning rules and Learning methods of ANN-Single Layer, Multilayer Feed forward networkRecurrent network.

UNIT II NEURAL NETWORK ARCHITECTURES AND ALGORITHMS 9

Mcculloh Pitts neuron-Hebbnet-Perceptron-Adaline-Hopfield net-Maxnet-Mexican HatHamming net-Kohonen self-organizing map-Adaptive resonance theory-Back propagation neural net.

UNIT III NEURAL COMPUTING 9

Terminology-Adaptive co-efficient connection-Learning law-processing elementscheduling function-Transfer function-Transformations-Weights-Application of neural computing for pattern classification and recognition.

UNIT IV FUZZY THEORY 9

Fuzzy set theory- Fuzzy relations-Linguistic variables-Membership functions-fuzzy to crisp conversions-fuzzy rule base-choice of variables-derivation of rules-Defuzzification methods-Fuzzy logc control-Structure of FLC-Mamdani and sugeno Fuzzy systems.

UNIT V NEURO FUZZY CONTROL 9

Cognitron and Neocognitron Architecture-Training Algorithm and application-Fuzzy associative memories-fuzzy and neural function estimators-FAM system ArchitectureComparison of Fuzzy and Neural systems-Adaptive neuro, Adaptive Fuzzy, Adaptive Neuro-Fuzzy interface systems-Neuro Controller, Fuzzy logic Controller for a temperature process and aircraft landing problem.

TOTAL: 45 hours

TEXT BOOKS

1. W.T.Miller, R.S.Sutton and P.J.Webrose, “Neural Networks for Control”, MIT Press, 1996.
2. George J.Klir and Bo Yuan, “Fuzzy Sets and Fuzzy Logic: Theory and Applications”, Prentice Hall, First Edition, 1995.

REFERENCE BOOKS

1 Lawrene Fausset, “Fundamentals of neural networks”, Prentice Hall, 1994.
2 D.Drainkov, H.Hellendoorn arrow, M.Reinfrank, “An Introduction to Fuzzy control”, Narosa publishing Co., New Delhi, 1996.
3 Timothy J.Ross, “Fuzzy logic with Engineering Applications”, Mc Graw Hill, Newyork, 1996.
4 S.N. Sivanandam, S.N.Deepa, “Principles of Soft Computing”, Wiley India Pvt. Ltd., New Delhi, 2007.

15EEE167 PLC AND DISTRIBUTED CONTROL SYSTEM 3 0 0 3

COURSE OBJECTIVES:

To give an introductory knowledge about PLC and the programming languages. To give adequate knowledge about of application of PLC. To give basic knowledge in the architecture and local control unit of distributed control system. To give adequate information in the interfaces used in DCS.To give basic knowledge about Computer Controlled Systems

COURSE OUTCOME:

CO-1: Recognize logical process control in automation (PLC and DCS based automation).
CO-2: Connect the PLC peripherals with the PLC for logical functioning.
CO-3: Develop basic PLC programmmes.
CO-4: Maintain PLC.
CO-5: Specify PLC control hardware and fixing criteria
CO-6: Describe PLC software structure
CO-7: How to write medium level PLC programs (using ladder logic)
CO-8: Troubleshooting a typical PLC control system
CO-9: Specify SCADA and PLC control systems
CO-10: Students will have the information of data acquisition System
CO-11: Students will be capable to write Programs using ladder diagrams
CO-12: Students will have the information of DCS and communication values

UNIT I PLC **9**

Evolution of PLCs — Sequential and programmable controllers — Architecture GE Fanuc- ABB

- Siemens Higher end — Programming of PLC — relay logic — Ladder logic — Functional blocks programming.

UNIT II COMMUNICATION IN PLCS **9**

Requirement of communication networks for PLC — connecting PLC to computer — Use of Embedded PC as PLC — comparative study of Industrial PLCs - PLC application in Industrial Automation.

UNIT III DISTRIBUTED CONTROL SYSTEMS **9**

Evolution — Different architectures — Local control unit — Operator interface — Display‘s — Engineering interface. Case study - DCS - Study of two popular DCS available in market — Factors to be considered in selecting DCS.

UNIT IV HART AND FIELD BUS **9**

Introduction — Evolution of signal standard — HART Communication protocol — Communication modes — HART networks — HART commands — HART field controller implementation — HART and OSI model — Field bus — Introduction profibus, Mod bus – Foundation field bus — General field bus architecture — basic requirements of field bus standard — Field bus topology — Interoperability CAN & LIN bus .

UNIT V AS – INTERFACE (AS-i), DEVICENET AND INDUSTRIAL ETHERNET **9**

AS interface- Introduction, Physical layer, Data link layer and Operating characteristics. Devicenet:- Introduction, Physical layer, Data link layer and Application layer. Industrial Ethernet:- Introduction, 10Mbps Ethernet and 100Mbps Ethernet - Introduction to OLE for process control (OPC).

TOTAL: 45 hours

TEXT BOOKS

1. John.W. Webb, Ronald A Reis, “Programmable Logic Controllers - Principles and Applications”, Prentice Hall Inc., New Jersey, 2003.
2. B.G. Liptak, “Instrument Engineers Hand, Process control and Optimization”, CRC press- Radnor, Pennsylvania,2006.
3. M.Chidambaram, “Computer Control of Process,” Narosa Publishing, New Delhi, 2003

REFERENCES

1. A.S.Tanenbaum, Computer Networks, Third Edition, Prentice Hall of India, 1996.
2. Michael P.Lucas, Distributed Control System, Van Nastrand Reinhold Company, New York,1986.
3. Romilly Bowden, HART application Guide, HART Communication Foundation, 1999.
4. G.K.Mc-Millan, Process/Industrial Instrument and controls and handbook, Mc Graw Hill, New York, 1999.
5. Petrezeulla, Programmable Controllers, Mc-Graw Hill, 1989.
6. Hughes T, Programmable Logic Controllers, ISA Press, 1989.
7. Clarke, G., Reynders, D. and Wright, E., “Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems”, Newnes, 1st Edition, 2004.
8. Berge, J., “Field Buses for Process Control: Engineering, Operation, and Maintenance” , ISA Press, 2004.

SYLLABUS

SKILL ENHANCEMENT ELECTIVE COURSES

15GPD251	**Personality Development I**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To nurture & develop winning personalities, eventually leading them to become dynamic and socially responsible leaders. To avoid negative spiritual experiences and it's importance to keep the balance between spiritual and physical life. To guide and orient students into becoming effective and exceptional communicators

COURSE OUTCOMES:

CO-1: Develop interpersonal skills and be an effective goal oriented team player

CO-2: Develop professionalism with idealistic, practical and moral values

CO-3: Develop communication and problem-solving skills

CO-4: Focus on the application and integration of acquired knowledge and skills

CO-5: Enhance the holistic development and improve their employability skills

CO-6: Learn steps towards developing self-esteem

CO-7: Learn and develop self- motivation skills and develop a goal setting habit

UNIT I SOFT SKILLS I **6**

Introduction to Personality Development – Meaning-Features of personality=Dimensions of Personality=Determinants of Personality-Features and Traits- Components of self concept-Barriers-Self analysis

UNIT II SOFT SKILLS II **6**

Importance of Soft Skills – First impression-Work Place requirements-Discipline-Cleanliness-Hygiene-general Appearance--Building Confidence—Concept of Thinking and Usage-Value of Time-Focus & Commitment.

UNIT III SOFT SKILLS IN ACTION **6**

Grooming – Attire – Understanding others- – Stability & Maturity Development – Strength s – Weakness – Opportunities-threats -Merits of SWOT Analysis-Components-how to convert weakness into strengths-Goal settings

UNIT IV SELF AWARENESS AND SELF ESTEEM **6**

Definitions-Components of self awareness-Developing Self awareness -Self esteem-meaning-Steps to improve self esteem

UNIT V SELF MOTIVATION **6**

Motivation –Meaning-Techniques of self motivation-Motivation & goal setting – Motivation and emotion – Motivation at work.

Total :30 hours

REFERENCE BOOKS

i. Personality Development And Soft Skills---Barun K Mitra, Oxford Publication

ii. Seven habits of Higly Effective people – Stephen R. covey

iii. Emotion, motivation and Self regulation - Nathan C. Hall , McGill University, Canada
Thomas Goetz, University of Konstanz, Germany
http://www.emeraldgrouppublishing.com/

iv. Psychology of Selfesteem – Nathaniel Branden, Nash (1st edition),
Jossey-Bass (32nd anniversary edition

15GPD252 Personality Development II 2 0 0 2

COURSE OBJECTIVE:

To improve leadership quality, physical aspects of personality/posture and good team spirit. To inculcate the need to lead a healthy lifestyle and manage stress. To be a socially responsible and ethical citizen.

COURSE OUTCOMES:

CO-1: Learn basic Etiquette and develop confidence and skills to interact in meetings
CO-2: Learn to solve problems related to time, speed and distance
CO-3: Learn to solve problems related to age
CO-4: Develop quantitative aptitude skills and solve problems with fraction and decimals
CO-5: Develop logical thinking and develop skills to interpret analogies
CO-6: Display critical thinking skills and abilities to lead others toward common goals
CO-7: Inculcate a holistic personality through soft skills and aptitude development

UNIT I Soft Skills III **6**

Basic Etiquette – Email etiquette – Business etiquette – Telephone etiquette – Meeting etiquette – Adjustment of Role & Leadership – Team Management & Development

UNIT II QUANTITATIVE APTITUDE I 6

Percentage – Profit Loss -Discount – Ratio Proportion – Time & Work – Time, Speed & Distancel. Problems relating to ages- Permutation & Combination-Probability

UNIT III QUANTITATIVE APTITUDE II **6**

Mensuration Clocks and Calendars- Boats-Simple Interest –Compound Interest- Fractions and Decimals – Square roots – Functions.

UNIT IV ANALYTICAL PROBLEMS **6**

Introduction – Linear Sequencing – Seating Arrangements – Distribution/Double Line Up – Selection – Ordering and Sequencing – Binary Logic – Venn Diagrams –Directions.

UNIT V LOGICAL PROBLEMS **6**

Introduction to Logical problems – Cause and Effect – Course of Action – Statement and Assumption – Letter and Symbol series – Analogies.

TOTAL : 30 hours

REFERENCE BOOKS

1. Personality Enrichment--K R Dhanalakshmi And N S Raghunathan, Margham Publications
2. Personality Development --Dr V M SelvarajBhavani Publications
3. Quantitative Aptitude – R. S Aggarwal
4. Logical and Analytical Reasoning (English) 30th Edition – A.K Gupta

15GPD253	Personality Development III	2	0	0	2

COURSE OBJECTIVE:

To enhance the corporate readiness and continuous employability. To provide a proper verbal, written communication skills and interpersonal & group skills

COURSE OUTCOMES:

CO-1: Ability to speak in public with awareness towards phonetics and grammar knowledge
CO-2: Get familiarized with articulation exercises and get control over rate and flow of speech
CO-3: Develop a personality transformation with more inclination towards developing positive attitudes
CO-4: Able to practice time management and avoid procrastination
CO-5: Demonstrate an understanding of group dynamics and effective teamwork.
CO-6: Establishing and maintaining trust in others to complete projects and tasks
CO-7: Understand the role of attitude in personality development and its importance in character building

UNIT I VERBAL APPTITUDE I **6**

Phonetics/Neutral Accent/Pronunciation – Speech Mechanism/Mouth & Face Exercise – Vowels & Consonants – Sounds – Syllable and Syllable Stress/ Word Stress – Sentence Stress & Intonation – Articulation Exercise – Rate of Speech / Flow of Speech / Idiomatic Phrases.

UNIT II VERBAL APTITUDE II **6**

Singular/plural-present tense/past tense—genders
Prepositions-conjunctionsChoice of words—simple sentences—compound sentences---summarising phrases—Synonyms—Antonyms—Analogies—Similar Words

UNIT III Soft SKILLS IV **6**

Attitude—Meaning-Features of attitude-Formation-Personality Factors-Types of attitude-change in attitude-Developing Positive attitude.

UNIT IV Time Management **6**

Definition –Meaning-Importance, Value of time as an important resource- comparison of Time and Money-Circle of influence and circle of control—Definiton of URGENT and IMPORTANT—Time Wasters and how to reduce—Procrastination—meaning and impact- 4 Quadrants.

UNIT V Team Building **6**

Meaning—Aspects of team building—Process of team building—Types of Teams-Team ethics and Understanding-Team trust and commitment

TOTAL : 30hours

REFERENCE BOOKS

1. Managing Soft Skills And Personality--B N Ghosh Mcgraw Hill Publications
2. Principles and Practices of Management Shejwalkar and Ghanekar McGraw Hill Latest
3. Time management for Busy people – Roberta roesch, TatamcGraw-Hill Edition
4. Personality Development --Dr V M Selvaraj, Bhavani Publications

15GPD254 Personality Development IV 2 0 0 2

COURSE OBJECTIVE:

To develop awareness of different job search techniques, including how to employ practical networking techniques. To begin to recognize the skills developed during research and analyse how to present these effectively in written application. To critique the strengths and weaknesses of their own and colleagues' current CVs. To understand interview processes and practice being interviewed in a supportive environment

COURSE OUTCOME:

CO-2: Identify and use effective presentations, use different types of presentations, plan a presentation,
CO-3: Build a presentation, develop an introduction, capture the audience attention, organize the body of
CO-4: the presentation, use transitions, and conclude the presentation.
CO-5: Incorporate visual aids, understand the types of visual aids, display, and create visual aids.
CO-6: Learning the difference between leadership and management.
CO-7: Empowering, motivating and inspiring others.
CO-8: Gaining insight into your patterns, beliefs and rules.
CO-9: Understanding good leadership behaviors.

UNIT I Soft SKILLS V 6

Assertiveness—Meaning—Importance of assertiveness- Characteristics of assertive communication-Merits – forms of assertion—Causes of misunderstanding

UNIT II Communication Skills 6

Meaning—Elements of communication—Functions of communication—Principles of communication—Formal and Informal communication—Barriers in Communication—Characteristics of good communication—Feedback—communication systems.

UNIT III Presentation Skills I 6

Meaning—Importance of Presentation—Concept of 5 w's and one H--- understanding the audience—Types of presentations—How to make effective presentation

UNIT IV Presentation Skills II **6**

Use of slide, PPT's. and visuals—Rules for slide presentation—precautions ---seminars and conferences-Steps to eliminate Stage fear.

UNIT V Change Management **6**

Definition – Necessity - Resistance towards Change – 10 Principles of Change Management – Leaders approach – Effective Change management.

TOTAL: 30hours

REFERENCE BOOKS

1. Helping employees embrace change - LaClair, J. and Rao, R. Helping Employees Embrace Change, McKinsey Quarterly, 2002, Number 4.
2. Who Moved My Cheese by Spencer Johnson published by vermilion first ediion
3. Effective Communication. Adair, John. London: Pan Macmillan Ltd., 2003.
4. Business Communication Today: Bovee, Courtland L, John V. Thill & Barbara E. Schatzman. Tenth Edition. New Jersey: Prentice Hall, 2010.

15NSS255	**NSS-I**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To understand the community in which they work. To understand themselves in relation to their community. To identify the needs and problems of the community and involve them in problem solving process.

COURSE OUTCOME:

CO-1: Students will acquire skills that will make them employable locally, nationally and gain certification recognized by the industry

CO-2: To create awareness in social issues.

CO-3: To participate in mass education program.

CO-4: To develop some proposals for local slum area development and waste disposal.

CO-5: To create environmental awareness.

CO-6: To participate in relief and rehabilitation work during natural calamities

CO-7: Able to inculcate the attitude and importance of volunteerism in social activities and at the time of societal needs

Unit I Introduction and Basic Concepts of NSS 3

History, Philosophy, aims & objectives of NSS,Emblem, flag, motto, song, badge etc.Organizational structure, roles and responsibilities of various NSS functionaries

Unit II NSS Programmes and Activities 9

Concept of regular activities, special camping, Day Camps. Basis of adoption of village/slums, Methodology of conducting survey,Financial pattern of the scheme,Other youth prog./schemes of GOI,Coordination with different agencies. Maintenance of the Diary

Unit III Understanding Youth 4

Definition, profile of youth, categories of youth,Issues, challenges and opportunities for youth.Youth as an agent of social change

Unit IV Community Mobilisation 8

Mapping of community stakeholders.Designing the message in the context of the problem and the culture of the community,Identifying methods of mobilization, Youth-adult partnership .

Unit V Volunteerism and Shramdan 6

Indian Tradition of volunteerism,Needs and importance of Volunteerism,Motivation and Constraints of Volunteerism Shramdan as a part of volunteerism

TOTAL : 30 hours

15NSS256 NSS-II 2 0 0 2

COURSE OBJECTIVE:

To develop among themselves a sense of social and civic responsibility. To utilise their knowledge in finding practical solution to individual and community problems.

COURSE OUTCOMES:

CO-1: Develop qualities of a good leader

CO-2: and understand the role of youth in leadership and educate them with qualities of a good leader

CO-3: Develop inter personal skills, problem solving and quick decision-making ability

CO-4: Develop ability to combat life competencies through development of interpersonal skills

CO-5: Be able to advocate peace and develop ability to resolve conflicts

CO-6: Patronize youth development programs at state and national level

CO-7: Realize a sense of social and civic responsibility in youth population

Unit I Importance and Role of Youth Leadership 6

Meaning and types of leadership,Qualities of good leaders; traits of leadership,Importance and role of youth leadership

Unit II Life of Competencies 10

Definition and importance of life competencies, Communication,Inter Personal, Problem-solving and decision making

Unit III Social Harmony and National Integration 7

Indian history and culture, Role of youth in peace building and conflict resolution,Role of youth in Nation building

Unit IV Youth Development Programmes in India 7

National Youth policy,Youth development programmes at National level, State level and Voluntary level Youth-focused and Youth-led organizations

TOTAL: 30 hours

15NSS257	**NSS-III**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To develop competence required for group-living and sharing of responsibilities. To gain skills in mobilising community participation. To acquire leadership qualities and democratic attitude.

COURSE OUTCOMES:

CO-1: To develop awareness and propagand about fundamental rights and duties, human rights and RTI act

CO-2: To develop consciousness about gender equality and understand the dynamics and impact of family oriented growth

CO-3: To propagand about importance of health, food and nutrition in the society and conduct programs on its importance

CO-4: To create awareness in youngsters about healthy life style and bad effects of drug abuse

CO-5: To inculcate the positive effects of yoga in the society and propagand it as a preventive, promotive, and curative method for various health issues

CO-6: Practice and propagand the importance of lifestyle changes to combat immoral and unethical activities in youth

CO-7: Promote moral values and incorporate ethical practices to lead a holistic lifestyle

Unit I Citizenship 6

Basic Features of Constitution of India,Fundamental Rights and Duties,Human Rights,Consumer awareness and the legal rights of the consumer,RTI.

Unit II Family and Society 5

Concept of family, community, (PRIs and other community-bases organizations) and society,Growing up ithe family – dynamics and impact, Human Values,Gender justice.

Unit III Health, Hygiene & Sanitation 6

Definition, needs and scope of health education,Food and Nutrition, Safe drinking water, water borne diseases and sanitation (Swachh Bharat Abhiyan), National Health Programme, Reproductive Health.

Unit IV Youth Health 5

Healthy Lifestyles , HIV AIDS, Drugs and Substance abuse, Home Nursing, First Aid

Unit V Youth and Yoga 8

History, philosophy and concept of yoga, Myths and misconceptions about yoga- Different Yoga traditions and their Impacts- Yoga as a preventive, promotive, and curative method- Yoga as a tool for healthy lifestyle.

TOTAL: 30 hours

15NSS258	**NSS-IV**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To develop capacity to meet emergencies and natural disasters. To practice national integration and social harmony

COURSE OUTCOMES:

CO-1: Understand the importance of environmental conservation and its impact on climate change

CO-2: Propagand about implementation of environmental conservation techniques such as the rain water harvesting, energy conservation, waste land development and afforestation

CO-3: Create awareness about disaster management and mitigation methods in the society

CO-4: Realize the importance of the role of youth in project management and implementation of societal activities

CO-5: Develop knowledge on data analysis and collection; learn about project monitoring and dissemination of reports

CO-6: Understand the need for concern for environment, disaster management and waste management in the current scenario with respect to global circumstances

CO-7: Realize the need to follow moral code of practice in profession as well as personal life

Unit I Environment Issues **9**

Environment conservation, enrichment and Sustainability- Climate change- Waste management- Natural resource management- (Rain water harvesting, energy conservation, waste land development, soil conservations and afforestation).

Unit II Disaster Management **6**

Introduction to Disaster Management, classification of disasters- Role of youth in Disaster Management

Unit III Project Cycle Management **9**

Project Planning- Role of youth in Disaster Management- Role of youth in Disaster Management- Project Implementation- Project Monitoring- Project Evaluation: impact assessment

Unit IV Documentation and Reporting **6**

Collection and analysis of data- Preparation of documentation/reports- Dissemination of documents/reports

TOTAL: 30h

15NSS259	**NSS-V**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To inculcate the need to lead a healthy lifestyle. To be a socially responsible and ethical citizen

COURSE OUTCOMES:

CO-1: Develop expertise in related vocational skills which improves their employment potential.

CO-2: Develop opportunities for setting up business ventures through collaboration and tie- up

CO-3: Ability to develop entrepreneur skills and develop knowledge about the necessary financial supports available.

CO-4: Emphasis on role of youth in crime prevention through political debates about law, order and punishment

CO-5: To develop therapy programs to negate the physiological and sociological factors pushing youth to criminal activities

CO-6: Propagand awareness about anti-ragging, measures to tackle crimes through peer mentoring and counselling programs

CO-7: Inculcate the spirit of ethical and socially responsible citizen

Unit I Vocational Skill Development` 15

This Unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skills will be drawn up, based on the local conditions and the opportunities. Each volunteer will have the option to select two skill-areas out of this list – one such skill in each semester. The education institution (or the university) will make arrangements for the developing these skills in collaboration with established agencies that posses the necessary expertise in the related vocational skills.

Unit II Entrepreneurship Development 8

Definition & Meaning- Qualities of good entrepreneur- Steps/ways in opening an enterprise- Role of financial and support service Institutions

Unit III Youth and Crime 7

Sociological and Psychological Factors influencing Youth Crime- Peer Mentoring in preventing crimes Awareness about Anti-Ragging- Cyber Crime and its Prevention - Juvenile Justice.

TOTAL : 30h

15NSS260	**NSS-VI**	**2**	**0**	**0**	**2**

COURSE OBJECTIVE:

To gain skills in mobilizing community participation. To acquire leadership qualities and democratic attitude

COURSE OUTCOMES:

CO-1: Develop expertise in related vocational skills which improves their employment potential. Collaboration with established agencies to promote these initiatives

CO-2: Initiate and propagate self-defense programs and trainings

CO-3: Develop stress management skills through time management by setting up of goals

CO-4: Develop a holistic improvement though positive thinking, setting life goals and self-confidence

CO-5: Develop skills in writing proposals to appropriate funding agencies

CO-6: Inculcate responsibility and practice code of ethics in all activities in youth

CO-7: Make way towards development of more responsible citizens

Unit I Vocational Skill Development **18**

This Unit will aim to enhance the employment potential of the NSS volunteers or, alternately, to help them to set up small business enterprises. For this purpose, a list of 12 to 15 vocational skills will be drawn up, based on the local conditions and the opportunities. Each volunteer will have the option to select two skill-areas out of this list – one such skill in each semester. The education institution (or the university) will make arrangements for the developing these skills in collaboration with established agencies that posses the necessary expertise in the related vocational skills.

Unit II Civil/Self Defense **4**

Civil defense services, aims and Objectives of civil defense- Needs for Self defense training

Unit III Resource Mobilisation **2**

Writing a Project Proposal- Establishment of SFUs

Unit IV Additional Life Skills **6**

Positive Thinking - Self Confidence and Self Esteem- Setting Life Goals and working to achieve them

Management of Stress including Time Management

TOTAL: 30hours